

ABSTRACT

Title of Thesis:	A Return to Making: Revitalization of a Post-Industrial Steel Mill
	Ryan James Litzinger, Master of Architecture, and Spring 2019
Thesis Directed By:	Professor Brian Kelly, School of Architecture Planning, and Preservation

This thesis focuses on the large number cities with post-industrial remnant buildings. These buildings often hold historical and cultural significance but are often left underutilized, vacant, or are destroyed. This thesis proposes that with the implementation of educational, business incubator, and maker space programming these buildings can be revitalized to a new kind of making. As a case study this thesis focuses on a former steel mill Machine Shop in Johnstown, Pennsylvania.

A RETRUN TO MAKING: REVITALIZATION OF A POST-INDUSTRIAL
STEEL MILL

by

Ryan James Litzinger

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Advisory Committee:
Professor Brian Kelly, Chair
Professor Emeritus Karl Du Puy, Advisor
Professor Hooman Koliji, Advisor

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Chapter 1: Johnstown, Pennsylvania in Context

Overview

Johnstown, Pennsylvania lies within the Laurel Highlands region of the Allegheny Mountains at the confluence of the Little Conemaugh, Stoney Creek, and Conemaugh rivers. The former company town boomed in the late 1800's and early 1900's as one of the largest producers of iron and steel products. Despite its rich history in iron and steel manufacturing, Johnstown is most notably remembered for its devastating floods. Unfortunately, the decline of the steel industry and the catastrophic flooding brought Johnstown into a state of decay, eventually resulting in a neglected, dilapidated area. The city would ultimately find itself as one of the failing rustbelt cities with a diminished economy, an aging workforce, and little to no business investments.

Company Towns

In the early to mid-1800's, Johnstown experienced a large economic boom due to its proximity to water as well as the construction of the Pennsylvania Mainline. The Mainline would allow Johnstown industries to easily transport goods (predominantly iron ore products) across the state by canal to Pittsburgh and by rail to Philadelphia. With the success of the iron industry in Johnstown, the Cambria Iron Works turned Johnstown into a company town. The term "company town" does not have a clear and concise definition. However, this definition, specified in the *Encyclopedia of Social*

Sciences from 1931, will suffice for the purposes of this thesis: “a community inhabited solely or chiefly by the employees of a single company or a group of companies which also owns a substantial part of the real estate and houses.”¹ As a capitalist country, company towns found themselves as a vital part of industry in the United States.

In the case of Johnstown, the Cambria Iron Co. became a powerful and wide-reaching company, involving itself in almost every aspect of life within the city. Like other company towns, Cambria Iron utilized the Wood-Porell & Co. Store as its company store. The company store enabled employees to take out a line of credit with approval from their boss to purchase goods. In addition, the company commonly issued company script in lieu of wages. This script was commonly accepted currency throughout the city, being accepted for services such as physician fees. Following the grant denial by the state for a new hospital, Cambria Iron was the first company in the U.S. to construct a hospital for its employees. This allowed the company quick and easy access to care when accidents occurred. As a “gift” to Johnstown, the Cambria Iron Works also constructed a library in 1881 for the use of the public. Furthermore,

¹ Horace B. Davis, *Company Towns, Encyclopedia of the Social Sciences*, vol. 4 (New York, NY: Macmillan, 1931), 119).

the company went on to support cultural and recreational institutions such as the YMCA, the Johnstown Opera House, and the Art Institute for Women.²

The intense involvement of Cambria Iron in the development of infrastructure enabled Johnstown to neglect allocating funds for such improvements. Cambria Iron began investing in infrastructural development themselves with the increase and regulation of the water supply to the city. Cambria Iron followed by Bethlehem Steel would retain ownership until 1963 when the surrounding boroughs purchased the water authority. Other infrastructure appendages included the Johnstown Street Railway Company, Cambria Natural Gas Company, and communication lines such as the telegraph and, later, telephone.³

The cartel-like involvement of the steel mill proved to be costly. When the Bethlehem Steel mill closed in 1994, it left thousands of workers out of jobs. With scarce employment, much of the population was forced to move out of Johnstown. The diminished population as well as the scarcity of employment severely damaged the economic status of Johnstown.

² Natalie Gillespie et al., "Johnstown," ed. Kim E. Wallace, in *The Character of A Steel Mill City: Four Historic Neighborhoods of Johnstown, Pennsylvania* (Washington, DC: National Park Service, 1989).

³ Natalie Gillespie et al., "Johnstown," ed. Kim E. Wallace, in *The Character of A Steel Mill City: Four Historic Neighborhoods of Johnstown, Pennsylvania* (Washington, DC: National Park Service, 1989).



Figure 1 U.S. Rust Belt

(Source: Author)

The “Rustbelt”

As a decaying iron and steel town, Johnstown was categorized as part of the “Rust Belt.” The term geographically refers to cities in the Northeast to the Midwest parts of the U.S that industrialized extensively by the use or production of iron and steel in the nineteenth and early twentieth century. (Figure 1) Unfortunately, these cities experienced a manufacturing decline towards the end of the twentieth century. Thus, the term “rust belt” paints the image of vacant factories and homes, crumbling streets,

and deserted towns.⁴ The shifts that occurred from the deindustrialization of rust belt cities were, in most cases, determined by the size of the cities. For larger cities with more economic diversity and more resources, the decline in industry proved to be less detrimental than it was in the smaller cities and towns. Sadly, Johnstown fell into the latter category. As a small industrial city, it fell victim to deindustrialization, which caused an economic downturn. These cities would also find a large disadvantage in their capability to act. Small cities lack resources that are sought after by investing companies. These resources are not limited to physical materials but often include the education and capabilities of the city's workforce. The manufacturing environment of today is heavily focused on the technical skills of its workforce. When large manufacturing companies do become interested in a town, the headquarters will often be located elsewhere, removing the decision makers from any connection to the area.⁵

⁴ Connolly, James J., *After the Factory: Reinventing Americas Industrial Small Cities*. Lanham, MD: Lexington Books, 2010. 1.

⁵ Connolly, James J., *After the Factory: Reinventing Americas Industrial Small Cities*. Lanham, MD: Lexington Books, 2010. 2-5.

Demographics

Johnstown peaked in the early to mid-20th century with a population of 67,320 in 1920.⁶ A significant percentage of the population was comprised of immigrants from Europe including (but not limited to) Austria, Germany, Hungary, and Ireland. Today, the population is under one third of that with 20,978 residents in 2010. Of this population, 80% are white alone, followed by only 15% of the population being Black or African American and 4% being of two or more races.⁷ Comparatively, the percentage of Black or African Americans in Johnstown is slightly higher than the national average of 13%. The median age of the population in Johnstown is 42 years; additionally, 18% of the population being 62 years or older—well above the national average of 14%.⁸ The decline in population and the increasing number of citizens at

⁶ "Population.us," Johnstown, PA Population, accessed March 27, 2018,

<http://population.us/pa/johnstown/>.

⁷ "Johnstown, Pennsylvania Population:Census 2010 and 2000 Interactive Map, Demographics,

Statistics, Quick Facts," Johnstown, PA Population - Census 2010 and 2000 Interactive Map,

Demographics, Statistics, Quick Facts - CensusViewer, , accessed March 24, 2018,

<http://censusviewer.com/city/PA/Johnstown>.

⁸ "Johnstown, Pennsylvania Population: Census 2010 and 2000 Interactive Map, Demographics,

Statistics, Quick Facts," Johnstown, PA Population - Census 2010 and 2000 Interactive Map,

Demographics, Statistics, Quick Facts - CensusViewer,, accessed March 27, 2018,

<http://censusviewer.com/city/PA/Johnstown>.

retirement age leaves a significantly low percentage of the population as a part of the workforce.

Economics

The beginning of the 20th century saw the height of the steel industry. Johnstown found itself as one of the largest producers of steel products. Cambria Steel was taken over by Midvale Steel and Ordinance Co. then, soon after, by Bethlehem Steel, who owned it until its closure. Even with the shifting of hands, the steel mill continued to thrive, as did Johnstown's economy. At this time, there were twenty separate manufacturing companies in Johnstown. Of these companies, one fifth made goods used in the manufacturing of steel. These businesses included coal mines, coal mining equipment, clay brick factories, and parts for machinery. Seven of the twenty manufacturing companies used iron or steel in the production of various equipment, parts for rail cars, furniture, and structural steel for buildings and bridges.⁹ In 1917, throughout the city, eleven separate banks accumulated a total of \$26.8 million (\$494 million today) in resources. The largest them was The First National Bank – Johnstown with \$9.4 million (\$173.5 million today) in resources.¹⁰ As with many

⁹ Whittle, Randy. 2013. *Johnstown, Pennsylvania: a History Part One*. Charleston, SC: History Press.
(61)

¹⁰ Whittle, Randy. 2013. *Johnstown, Pennsylvania: A History Part One*. Charleston, SC: History Press.(63)

factory towns, the unemployment rate fluctuated with the mills' layoff schedules.

When new equipment, orders, installations, etc. took place, there were often short layoffs for the company to adjust before workers were called back to resume production.

In January of 2018, the unemployment rate of Johnstown was estimated at 6.4%, 1.5 times the national average.¹¹ Currently, the most common industry for Johnstown according to employee statistics is healthcare and social assistance followed by retail trade, accommodation and food service, and manufacturing. In addition, the median household income comes in at almost \$30,000 less than the national average and \$18,000 less than the surrounding areas.¹²

¹¹ "Bureau of Labor Statistics Data." 2018. *U.S. Bureau of Labor Statistics*. U.S. Bureau of Labor Statistics. Accessed March 24.

https://data.bls.gov/timeseries/LAUMT4227780000000004?amp;data_tool=XGtable&output_view=data&include_graphs=true (<https://data.bls.gov/timeseries/LNS14000000>).

¹² "Johnstown, PA." 2018. *Data USA*. Accessed March 24. <https://datausa.io/profile/geo/johnstown-pa/#education>.

Chapter 2: The Founding, Success, and Destruction of Johnstown, Pennsylvania

The Foundation

Johnstown was originally referred to as “Conemaugh” when Jacob Schantz purchased the land. The acquisition of this property derived from the 1768 Treaty of Fort Stanwix. The treaty was between the surrounding Native American tribes and the British colonies and it led to the expansion of the colonies.¹³ Conemaugh changed hands several times until Jacob Shantz purchased the land in 1793.¹⁴ Jacob Schantz immigrated to the United States from Switzerland in 1769, arriving in Philadelphia.¹⁵

¹³ "1768 Boundary Line Treaty of Fort Stanwix," National Parks Service, accessed March 20, 2018, <https://www.nps.gov/fost/learn/historyculture/1768-boundary-line-treaty.htm>.

¹⁴ Lyndee Jobe. Henderson and R. Dean. Jobe, *Johnstown* (Charleston, SC: Arcadia, 2004), 7.

¹⁵ The First Village - Historic, accessed March 21, 2018, <https://www.johnstownpa.com/History/hist05.html>.

After moving to his new property, he began to clear the site and lay out his new settlement. (Figure 2)

Most accounts claim that his motivation was in anticipation for his settlement to become the projected new county's seat.¹⁶ After being disqualified as county seat, in 1807, Schantz liquidated his interest in the town. Peter Livergood purchased the town to sell it and reacquire it a few years later. This time, he held on to his investment in

¹⁶ The First Village - Historic, accessed March 24, 2018,
<https://www.johnstownpa.com/History/hist05.html>.

response to the newly developing Pennsylvania Mainline.

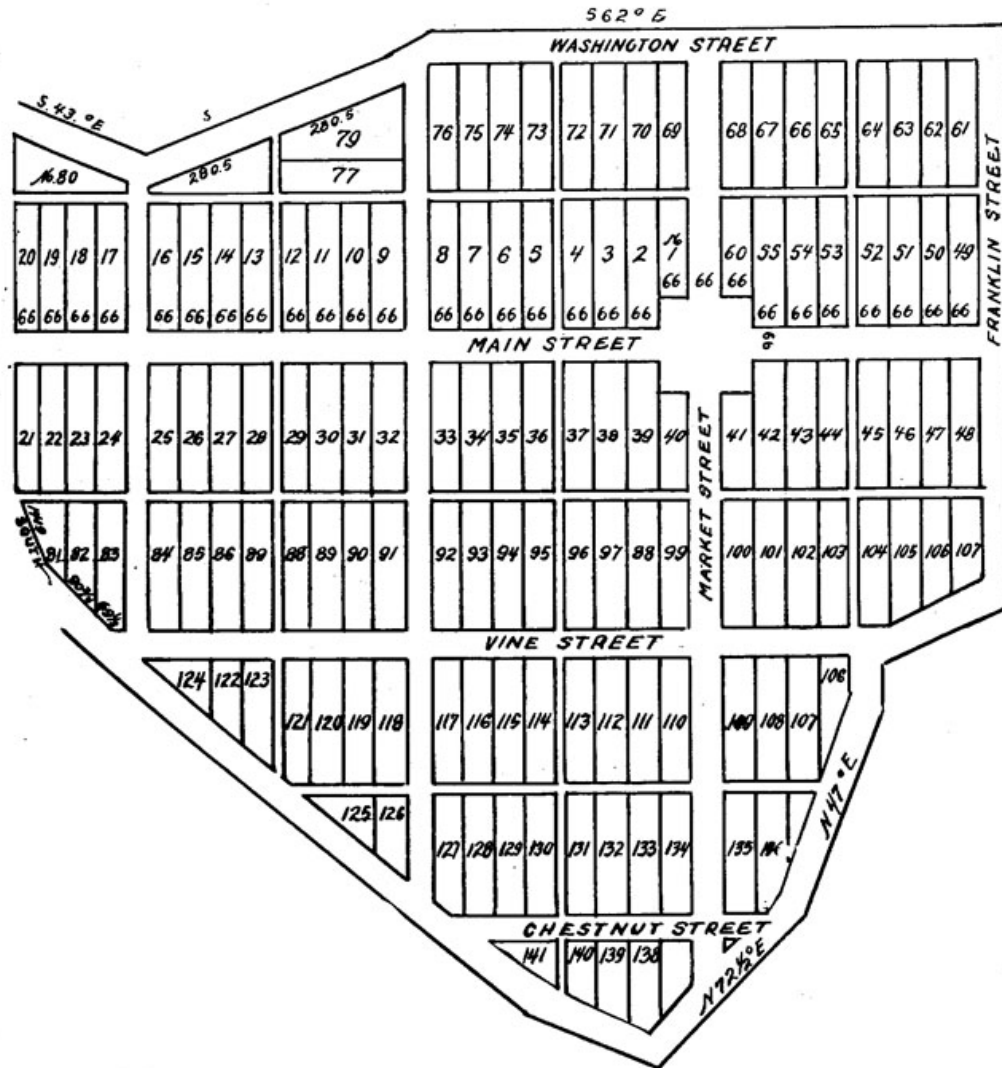


Figure 2 "Map of Johnstown's Original Street Plan" (Source: Johnstown Heritage Association)

In 1834, the town changed its name from "Conemaugh" to "Johnstown" after its founder. The misinterpretation of Joseph Shantz's name was described in a correspondence to the city of Johnstown by Dr. Loren Johns, a sixth-generation descendant of Joseph Schantz: "Joseph used the old German stylized script form of

the "Sch" that admittedly looked like a "J" to the untrained eye."¹⁷ Thus, the town was renamed "Johnstown" instead of "Shantztown." Yet, the intention remained the same: it was named in honor of Joseph Schantz (Johns).¹⁸

The Canal

Like many pre-industrial settlements, access to water played a significant role in the urban development of Johnstown. Thus, the city envelopes the confluence of the Little Conemaugh and the Stoney Creek rivers. This access to water played a pivotal role for the steel industry in Johnstown.

From 1826-1834, the Pennsylvania Mainline was constructed, connecting Philadelphia and Pittsburgh through both canal and rail. (Figure 3) The final leg of the Mainline from Philadelphia to Pittsburgh was the Western Division of the Pennsylvania Canal.¹⁹ The canal began in Johnstown and would follow the Conemaugh River to the Kiskiminetas River then finally to the Allegheny river, which led to Pittsburgh. The introduction of the canal gave opportunity for businesses (particularly iron mills) that surrounded the Conemaugh, Little Conemaugh, and

¹⁷ The First Village - Historic, accessed March 24, 2018,
<https://www.johnstownpa.com/History/hist05.html>.

¹⁸ The First Village - Historic, accessed March 24, 2018,
<https://www.johnstownpa.com/History/hist05.html>.

¹⁹ ExplorePAHistory.com, accessed March 26, 2018,
<http://explorepahistory.com/hmarker.php?markerId=1-A-1D5>.

Stoney Creek rivers to begin shipping goods across the state.²⁰

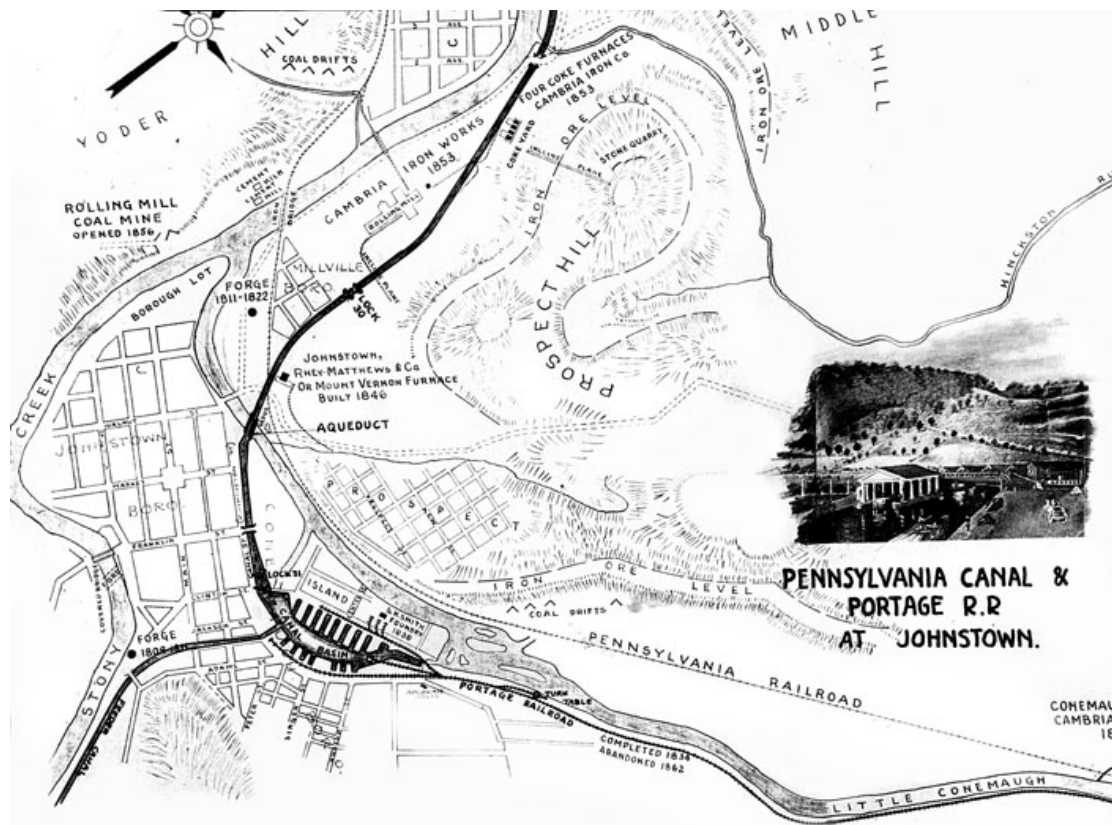


Figure 2 "Map Showing the Location of the Pennsylvania Canal and Portage railroad at Johnstown (c. 1850)

(Source: Johnstown Area Heritage Association)

The Railroad

The canal system established Johnstown as an essential part of the national manufacturing and transportation scene. However, as the age of rail took off, the

²⁰ "History of Steel in Johnstown," Johnstown Area Heritage Association, , accessed March 24, 2018, <http://www.jaha.org/attractions/heritage-discovery-center/johnstown-history/history-steel-johnstown/>.

canal soon found itself obsolete, closing in 1854 after the Pennsylvania Railroad began all-rail train services.²¹

The Pennsylvania Railroad allowed Johnstown Iron to expand their shipping radius. Additionally, the flourishing railroad industry further stimulated Johnstown's iron production of rail and various other rail related iron products. This gave rise to one of the late 19th and early 20th centuries leading iron and steel manufacturers: Cambria Iron Works, established in 1852.

Floods

Although Johnstown is known for its role in steel production, it is most prominently known for the "Johnstown Flood." The first flood in 1889 proved to be one of the nation's largest disasters; it was followed by two lesser known floods in 1936 and in 1977.

Until September 11, 2001, the Johnstown flood held the record for the largest loss of U.S. civilian lives in a single day,²² a total of 2,209 lives. Although there was heavy rainfall the night of May 30th, 1889, the disaster was truly due to the failure of the

²¹ ExplorePAHistory.com, accessed March 24, 2018, <http://explorepahistory.com/hmarker.php?markerId=1-A-1D5>.

²² "Education: Johnstown Flood Museum," The Great Johnstown Flood of 1889 Education Programs - Johnstown Flood Museum, , accessed March 26, 2018, <http://www.jaha.org/edu/flood/>.

Southfork Dam, just fourteen miles up the Little Conemaugh River. The South Fork Dam was owned by the South Fork Fishing and Hunting Club. The club hosted elite members such as Andrew Carnegie and Henry Clay Frick.²³

The original purpose of the South Fork Dam was to facilitate the Pennsylvania Mainline Canal. The construction of the dam began in 1841 but took over a decade to complete. Interruptions in the construction process resulted in damages that contributed to its failures. Before the dam was completed, it failed for the first time when it was at 50 percent completion in 1847. Deemed ready for operation in 1853, its use was short lived when the Mainline Canal closed in 1854.

The dam failed for the second time in 1862 under the ownership of the Pennsylvania Railroad. Fortunately, the water in Johnstown only rose two to three feet, causing minimal damage. With no further use, there was little effort to maintain the South Fork dam. In 1875, U.S. Congressman John Reilly purchased the dam and removed the sluice pipes that were used to drain the dam. This eliminated the ability to safely drain the dam and caused deterioration to the structure. Soon after, the dam was sold to Benjamin Ruff.²⁴

²³ "Facts about the 1889 Flood," Johnstown Area Heritage Association, , accessed March 24, 2018, <http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/facts-about-the-1889-flood/>.

²⁴ "South Fork Dam," National Parks Service, , accessed March 21, 2018, <https://www.nps.gov/jofl/learn/historyculture/south-fork-dam.htm>.

Ruff bought the prospect for the South Fork Fishing and Hunting Club. The new club insufficiently patched the dam and made fatal design additions. Ultimately, the additions, as well as the removal of the sluice pipes, led to the catastrophic failure of the dam on May 31, 1889, sending over 20 million tons of water hurling towards Johnstown. (Figure 4) In addition to the 2,209 deaths, 1,600 homes were destroyed and a total of \$17 million (\$432 billion today) of damages was amassed.²⁵ A few days later, Johnstown hosted the first peacetime disaster relief effort from the American Red Cross.²⁶

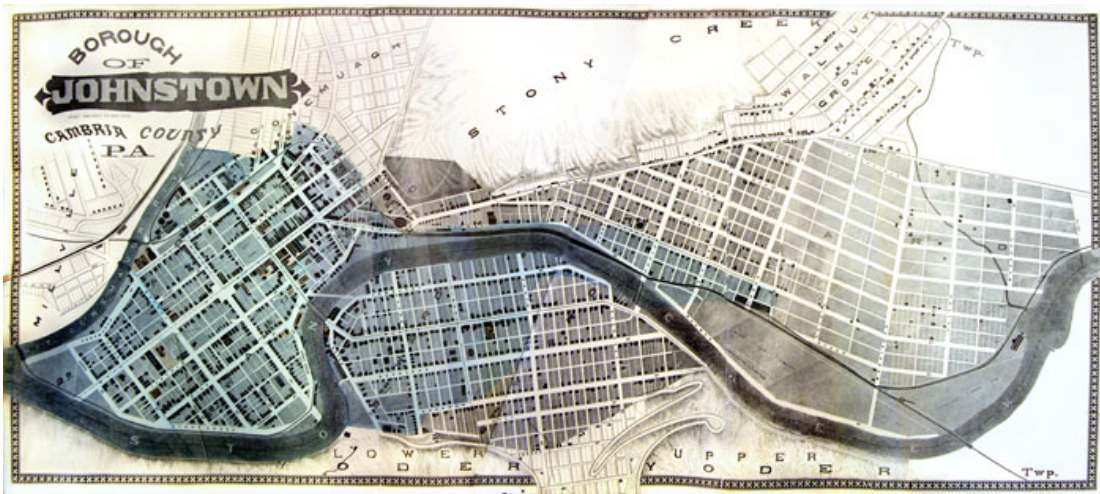


Figure 3 "Map of Johnstown Showing the Area of Destruction" (Source: Johnstown Area Heritage Association)

²⁵ "South Fork Dam," National Parks Service, , accessed March 21, 2018,

<https://www.nps.gov/jofl/learn/historyculture/south-fork-dam.htm>.

²⁶ "Facts about the 1889 Flood," Johnstown Area Heritage Association, , accessed March 24, 2018,

<http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/facts-about-the-1889-flood/>.

Some members of the South Fork Fishing and Hunting Club donated money towards relief efforts. “However, no club member ever expressed a sense of personal responsibility for the disaster.”²⁷ The avoidance of responsibility is described as: “...the first expression of outrage at power of the great trusts and giant corporations that had formed in the post-Civil War period. This antagonism was to break out into violence during the 1892 Homestead steel strike in Pittsburgh.”²⁸

Johnstown rebuilt and recovered from the flood until the spring of 1936 when heavy rains and runoff from melting snow caused the rivers to rise yet again. In certain areas, the waters rose fourteen feet, killing about twenty-four people, destroying seventy-seven buildings, and causing \$41 million dollars’ worth of damages.

The flood damages from 1936 in Johnstown as well as other flood related damages throughout Pennsylvania resulted in the Flood Control Act of 1936, signed by President Franklin D. Roosevelt. This act led to the construction of many dams throughout Pennsylvania by the Army Corps of Engineers as well as a nine-mile concrete channelization of the Little Conemaugh and the Stoney Creek rivers.

²⁷ "The Club and the Dam," Johnstown Area Heritage Association, , accessed March 24, 2018, <http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/the-club-and-the-dam/>.

²⁸ "The Club and the Dam," Johnstown Area Heritage Association, , accessed March 24, 2018, <http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/the-club-and-the-dam/>.

(Figure 5) These constructions were linked to the Johnstown Local Flood Protection Plan (JLFPP), a nationwide network of dams, channels, locks, canals, pipes, and tunnels. After its completion in 1943, promoters declared Johnstown a “Flood Free City.”²⁹

Unfortunately, this proved to be an overstatement. Johnstown withstood hurricanes, spring thaws, and storms until 1977, when the town flooded again. The last of the three major floods totaled \$300 million in damages in addition to the loss of eighty-five lives and, arguably, the death of Johnstown itself.³⁰ In the following decades, Johnstown saw a decline in business, industrial production, population, and, ultimately, morale.

²⁹ "1936 & 1977 Floods," Johnstown Area Heritage Association, , accessed March 21, 2018, <http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/1936-1977-floods/>.

³⁰ "1936 & 1977 Floods," Johnstown Area Heritage Association, , accessed March 21, 2018, <http://www.jaha.org/attractions/johnstown-flood-museum/flood-history/1936-1977-floods/>.



Figure 4 View of Johnstown riverfront with Hardened Concrete Edge (Source: Tribdem.com)

Chapter 3: Johnstown Iron & Steel

Iron Making Process

Through colonial times, Cambria County was host to at least ten different iron furnaces. Of these furnaces, several surrounded Johnstown and its rivers. Furnaces of this time took the shape of a flattened pyramid at 25 to 30 feet in height. (Figure 6)

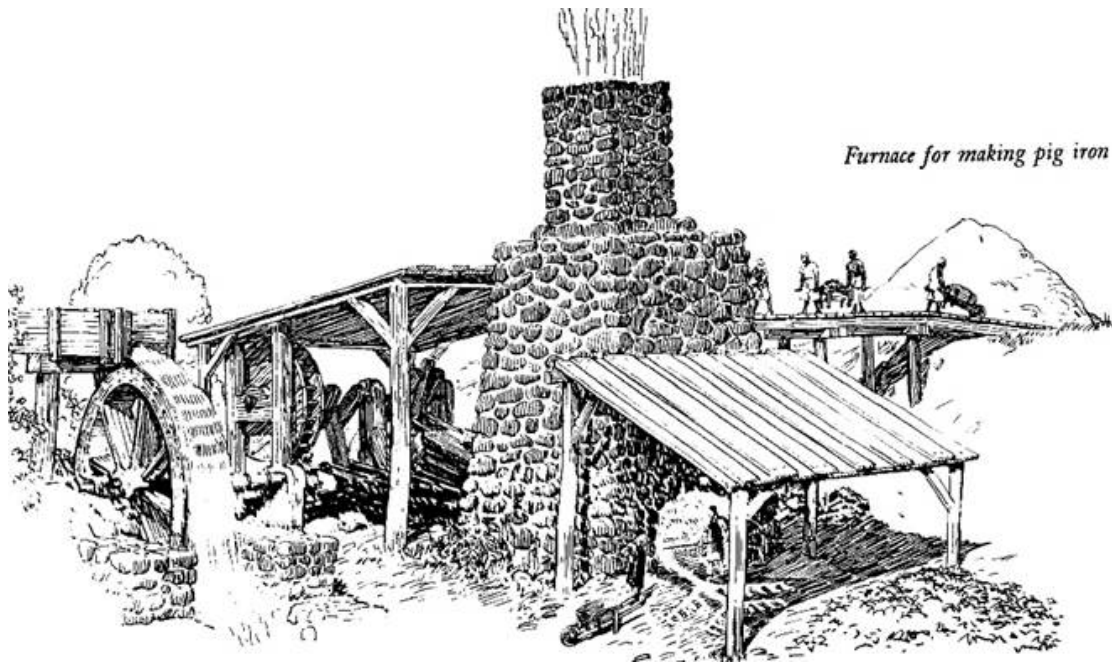


Figure 5 "Illustration of an Early Iron Furnace" (Source: Edwin Tunis: Colonial Craftsman 1957)

Constructed out of thick stone, the interior of the furnace was often lined with clay brick. A fire would be lit at the bottom of the furnace using wood or, more efficiently, coal. The raw iron ore would be placed at the top of the furnace allowing it to melt and fall in to the crucible. In the crucible, charcoal and limestone or another substance

that promoted separation would be added to the iron ore.³¹ Below the crucible was an opening for a bellows to fuel the flame. The bellows would often require a power source to maintain a consistent flow of air. This power was most often generated from a water wheel.³² Within the crucible, the molten iron would begin to separate; the “sag” or impurities would surface and then be drawn off. The remaining iron would then be poured from the bottom of the crucible into a mold. Due to the mold’s shape, the cooling iron was called “pig-iron.” After cooling, the pig-iron would then be sent to the forge where it would receive another heating, where the different amounts of charcoal were added to the pig-iron. After thoroughly heating the iron to a malleable state, the iron would be removed from the furnace and hammered into a 5”x6”x16” billet. Hammering the iron removed the excess carbon, creating a much stronger iron. The billets could then be heated and formed into a multitude of various products.

³¹ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 4.

³² Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 3.

Steel Making Process

The primary difference between iron and steel is the percentage of carbon found within the metal. Iron contains around 3.8 percent carbon, where steel contains only 0.4 percent.³³ Prior to the Bessemer process, steelmaking was extremely time-consuming and laborious. “Blister Steel” took days to produce and resulted in a relatively low yield of product. Heated carbon-free wrought iron was placed in a refractory box filled with carbonaceous powder for several days. It would then be allowed to cool, which would allow the iron to absorb the carbon-yielding steel, containing only one percent carbon. The surfaces of the steel were blistered due to the releasing of gasses, thus giving it its name.³⁴

The Bessemer Process exponentially expanded the production capabilities for forging making steel. The Bessemer Process was introduced into the steel and iron making industry in 1856 by two men: Sir. Henry Bessemer and William Kelly (both of whom will be discussed later in this chapter). The process involves the forcing of

³³ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 10.

³⁴ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 10.

pressurized cold air into a converter that is partially filled with melted cast iron. The addition of oxygen eliminates the carbon and silicon through combustion.³⁵ This process completely removed the carbon from the iron. Pig-iron composed of carbon and manganese would be added to the mixture. This results in large quantities of Bessemer steel, which was then poured into shapes.³⁶

Soon after the Bessemer process was invented, a new process using open-hearth furnaces was implemented. Open-hearth furnaces quickly took over as the primary method of steel production. Unlike the Bessemer process, the open-hearth permitted access to the steel while it was being heated. This allowed the company to have better quality control over the product. The open-hearth process took much longer than what was required for the Bessemer process, yet it was able to produce a higher yield of steel in a single turn. As technology advanced, eventually the electric arc furnace was introduced into the steel industry. Electric arc furnaces ultimately allowed for a higher-grade product than that of its predecessors, propelling its way into the modern steel industry.

³⁵ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*.

Washington, D.C.: United States Department of the Interior, National Park Service, 10.

³⁶ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*.

Washington, D.C.: United States Department of the Interior, National Park Service, 11.

The product resulting from steel-making is made is called an ingot. After being poured, ingots are placed into soaking pits; these pits evenly distribute heat throughout the ingot. The ingots are then sent through a series of rollers that shape the steel into slabs. The size of the slab depends on the intended purpose of the steel.

Cambria Iron & Steel Works

Prior to the establishment of the Cambria Iron Works, several iron forges would take advantage of the river transportation as well as the surrounding iron ore deposits surrounding the Conemaugh River. Around 1840, partners George King and Dr. Peter Shoenberger owned four iron furnaces as well as copious amounts of property within Cambria and Summerset Counties.³⁷ With their properties consisting of both iron and coal deposits in conjunction with the construction of the Pennsylvania Mainline, a fantastic opportunity for the partners to develop a rolling mill that would produce iron rails for the expanding railroad industry was at hand. In August of 1852, the two partners would establish the Cambria Iron Company and with New York investors they would begin the construction of a new rolling mill and coke furnaces.³⁸ The four

³⁷ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 15.

³⁸ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 15.

furnaces would be constructed north of the Cambria Rolling Mill. The mills would have a 13-foot bosh and would total 48 feet in height.³⁹ A little over 19 thousand tons of iron were produced in 1855 by furnaces one thru three (four had not been constructed until 1857). Additionally, in 1854 the Cambria Iron Works would begin rolling iron rails, producing 100 per day. The mill would then become the first to roll 30-foot rails in the U.S.⁴⁰ The Company would go on to produce some of the best quality rails in the U.S., widely endorsed by the Pennsylvania Railroad in 1857.⁴¹ With over a million dollars invested into the company the mill would begin production as soon as the necessary structures were in place. Although contracts and orders were coming in, financial setbacks due to rail and iron prices would cause the company to fail in 1854. The Martin, Morrell, & Company from Philadelphia had already been invested in the Cambria Iron Works and would soon decide to further

³⁹ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study: Cambria Iron Company: America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 37-39.

⁴⁰ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study: Cambria Iron Company: America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 37-39.

⁴¹ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 43.

invest allowing the company to continue operation. Still failing, Daniel Morell would maintain faith in the company thus organizing the Wood, Morell & Company organization that would lease the Cambria Iron Works from 1855-60. Later in 1862 Wood, Morrell, & Company would acquire the plant altogether.⁴² Following the acquisition, the company would begin to expand its reach into subsidiary businesses such as brickyards, coal and iron ore mines, transportation, gas and water supply

⁴² United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 15.

for the city, and a company store.⁴³ With continuously developing technology, the Cambria Iron Works would find itself developing steel manufacturing processes as early as 1850's. The Cambria Iron Works would invest in the relocation of the Gautier works from New Jersey. The Gautier Works operated as a subsidiary of Cambria Iron Works until 1881 where it would be absorbed into Cambria Iron. Further developments were being made at the time with investments of the Kelly

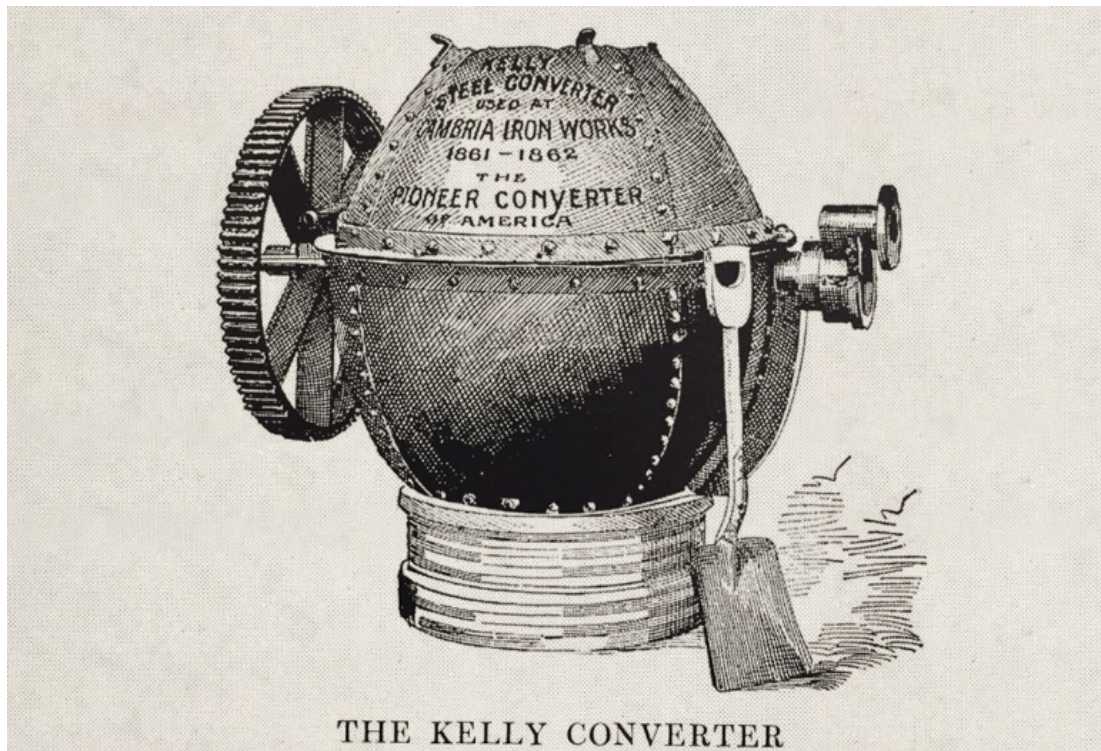


Figure 6 "The Kelly Converter"

(Source: John N. Boucher)

⁴³ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 47.

converter. The Kelly converter would produce steel in the same process as the Bessemer process. (Figure 7) Setting its investments in the Kelly Convert aside, Cambria Iron would construct several Bessemer steel works in 1869.⁴⁴ Thus, Cambria Iron would launch itself into the Steel manufacturing industry. Restructuring of the investing parties within the company would lead to a new name Cambria Steel in 1898.⁴⁵ The company would flourish until 1916 when Midvale Steel and Ordnance Company bought out Cambria Steel. The mill would remain in Midvale's hands until 1923 when Bethlehem Steel would acquire the Midvale Steel and Ordnance Company and its subsidiaries. Henceforth, Johnstown's Steel Industry would remain under Bethlehem Steel's Control until its closure in 1994.

Cambria Iron Innovations

Throughout Cambria Iron's years of operations, many technological contributions were made in the advancement of the Iron and steel industry. Cambria Iron is

⁴⁴ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 46.

⁴⁵ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*. Washington, D.C.: United States Department of the Interior, National Park Service, 101-104.

arguably one of the most influential Iron and Steel Mills within the iron and steel making industry.

With the infancy of the company, the mill desperately needed guidance for the production processes taking place within the mill. Thus, John Fritz a young yet knowledgeable engineer would arrive to the Cambria Iron Mill in 1854.⁴⁶ Fritz found the mill in great need of assistance. Many of the rails coming out of the mill would end up cracked and torn. With closer examination, John Fritz and his brother George Fritz would study the two-high rolling process. The process involved sending hot rails through a set of rollers then back to the beginning for another pass until the proper dimensions and shape were achieved. The brothers would realize that the cracking and tearing issues were caused due to the cooling of the iron while it was being passed back to the beginning of the rollers. They would come to invent the three-high process that would allow for the rails to be shaped by another set of rollers on its return pass. This would reduce the time it took to produce the rails as well as the temperature difference between passes. This process would greatly improve the end quality of the rails in which Cambria Iron became famously known for.

With the invitation of Daniel Morell, William Kelly would come to Cambria Iron in hopes to develop a forced air process for the production of steel. Kelly had been

⁴⁶ "John F. Fritz." Explore Pa History. 2011. Accessed March 28, 2018.

<http://explorepahistory.com/hmarker.php?markerId=1-A-24A>.

experimenting with the process since the early 1850's.⁴⁷ Eventually his process would come to light with his 1857 patent. At the same time Henry Bessemer was developing his process in England. Daniel Morell would obtain control of both process patents as well as a decarbonizing patent by Robert F. Mushet and would submit the combined machinery to the U.S. Patent office in the late 1860's.⁴⁸ This would greatly advance the process of making steel and ultimately allow for the replacement of iron rail production with steel rails.

By 1867 Cambria Iron would lead the U.S. with the first commercial order Bessemer steel rails. This would be followed by the construction of several Bessemer furnaces in 1871. With these installations Cambria Iron would become the sixth mill in the U.S. to install Bessemer Furnaces. The Bessemer process would soon find itself less favored to the Open-Hearth Furnaces which would surpass the Bessemer furnaces in production by the end of the 19th century. With the addition of the steel production, the Cambria Iron would continue to find itself as one of the major iron and steel produces within the country.

⁴⁷ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 16.

⁴⁸ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 16.

Bethlehem Steel in Johnstown

The Bethlehem Steel Company much like Cambria Iron Works, would begin in the 1850's and would continue to grow as the demand for iron and steel skyrocketed in the 19th and early 20th century. Bethlehem steel originated in from the Saucona Iron Company in Bethlehem. Pa. Another commonality between the two plats ware the influences of John Fritz, whom arrived in Bethlehem 1871 after working for Cambria Iron. Ultimately, Charles M. Schwab would direct the investments and movement s of the company. This entailed the purchasing of operating plants in order to keep up with the demand of WWI. Some of the companies included the Pennsylvania Steel Company and American Iron and Steel. These would be followed by Lackawanna Steel Company in 1922 and the Cambria plant, then owned by Midvale and Ordnance Company.⁴⁹ The acquisition of the Cambria Iron would become Bethlehem's largest plant and would allow for Bethlehem Steel to expand its markets into the production of railroad cars and parts. Bethlehem would continue to acquire companies into the 1950's.⁵⁰ Bethlehem Steel would continue to be a powerhouse of iron and steel

⁴⁹ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*.

Washington, D.C.: United States Department of the Interior, National Park Service, 104-105.

⁵⁰ Brown, Sharon A, Cambria Iron Company, and America's Industrial Heritage Project. 1989. *Historic Resource Study : Cambria Iron Company : America's Industrial Heritage Project, Pennsylvania*.

Washington, D.C.: United States Department of the Interior, National Park Service, 104-105.

production until the mid to late 1900's when it would succumb to the struggles of keeping up with the changing regulations, technologies, and the low cost of import steel from other countries such as China.

Chapter 4: Site Survey – Lower Cambria

Lower Cambria Mill Location

Throughout time, the Cambria Iron/Bethlehem Steel Mill would occupy a large majority of property within the City of Johnstown. The mill would be broken into several divisions including Franklin, Gautier, Lower Cambria or Lower Works, Rod and Wire Plant, and the Wheel Plant. (Figure 8). The Lower Cambria or Lower Works location is the original location of Cambria Iron Works. The Lower Cambria/Lower Works Division is located just north of the city center along the Little Conemaugh and the Conemaugh Rivers. The site boarder is made up of three differend barriers, the railline to the south, Prospect Hill to the East and Conemaugh river to the West. These elements have jettisoned the site form the surrounding urban fabric.(Figure 9)

Three types of access are provided to the site. The first being Iron Street, which runs along the Conemaugh River and closely boarders the buildings on site. The second means of access is one of pedestrian. In which a pedestrian bridge crosses the Conemaugh River connecting to Branch Street. Additionally, the southern site boarder is generated by an elevated railraod line. On the south side of the rail line is the Johnstown Amtrak station that provides the third means of access to the site. (Figure 11)

Up until the closure of the mill, the site was primarily navigated through a network of rails lines that connected the buildings to each other as well as to the main rail for

export. These rail lines have been mostly removed with a few remnants of them still poking through the ground surface. (Figure 12)z



Figure 7 "Map Showing Bethlehem Divisions (In Brown) Throughout Johnstown, Pennsylvania" (Source: Author)

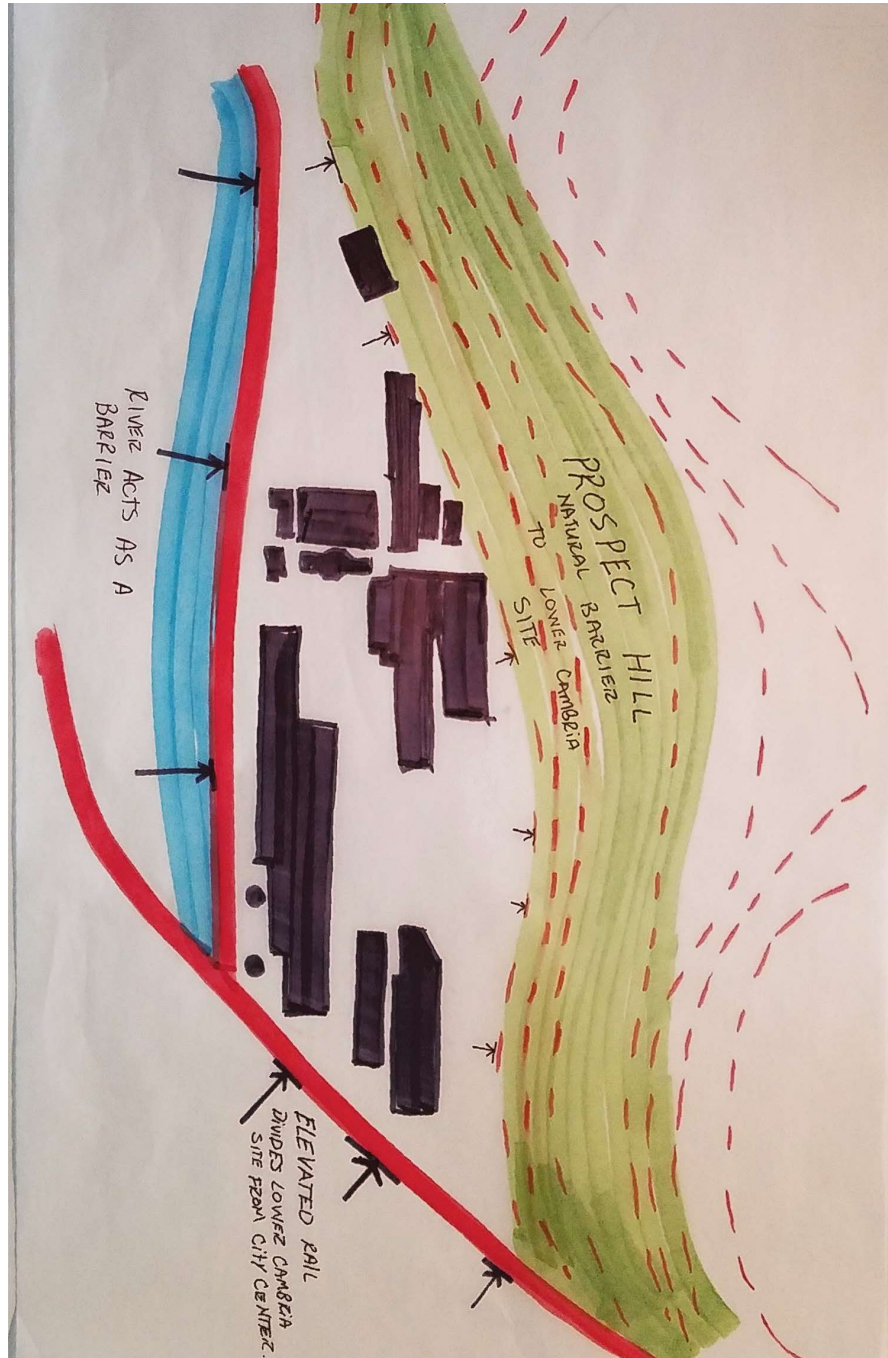


Figure 8 Lower Cambria/Lower Works – Barriers

Source: Author

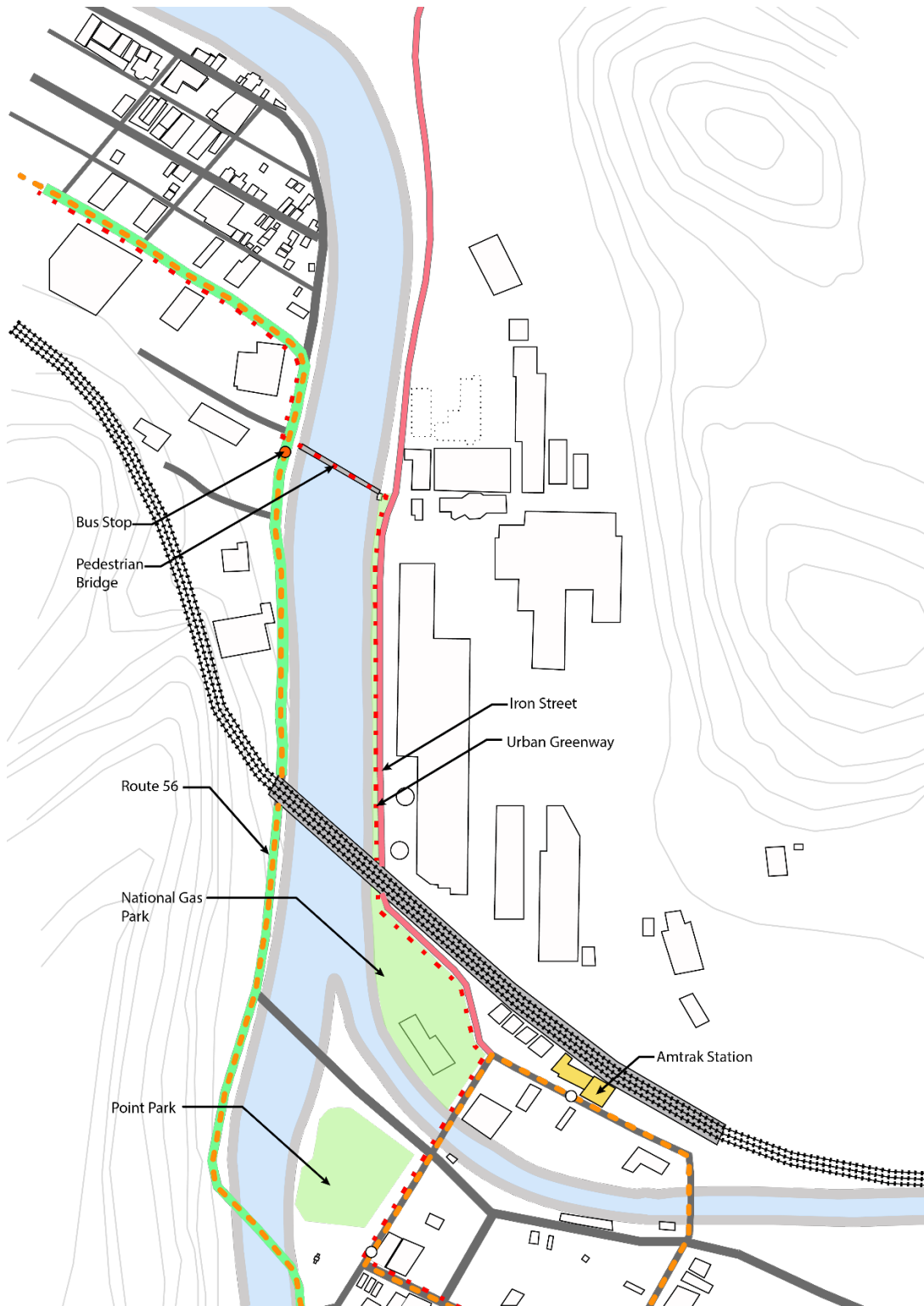


Figure 9 Lower Cambria Site Amenities

(Source: Author)

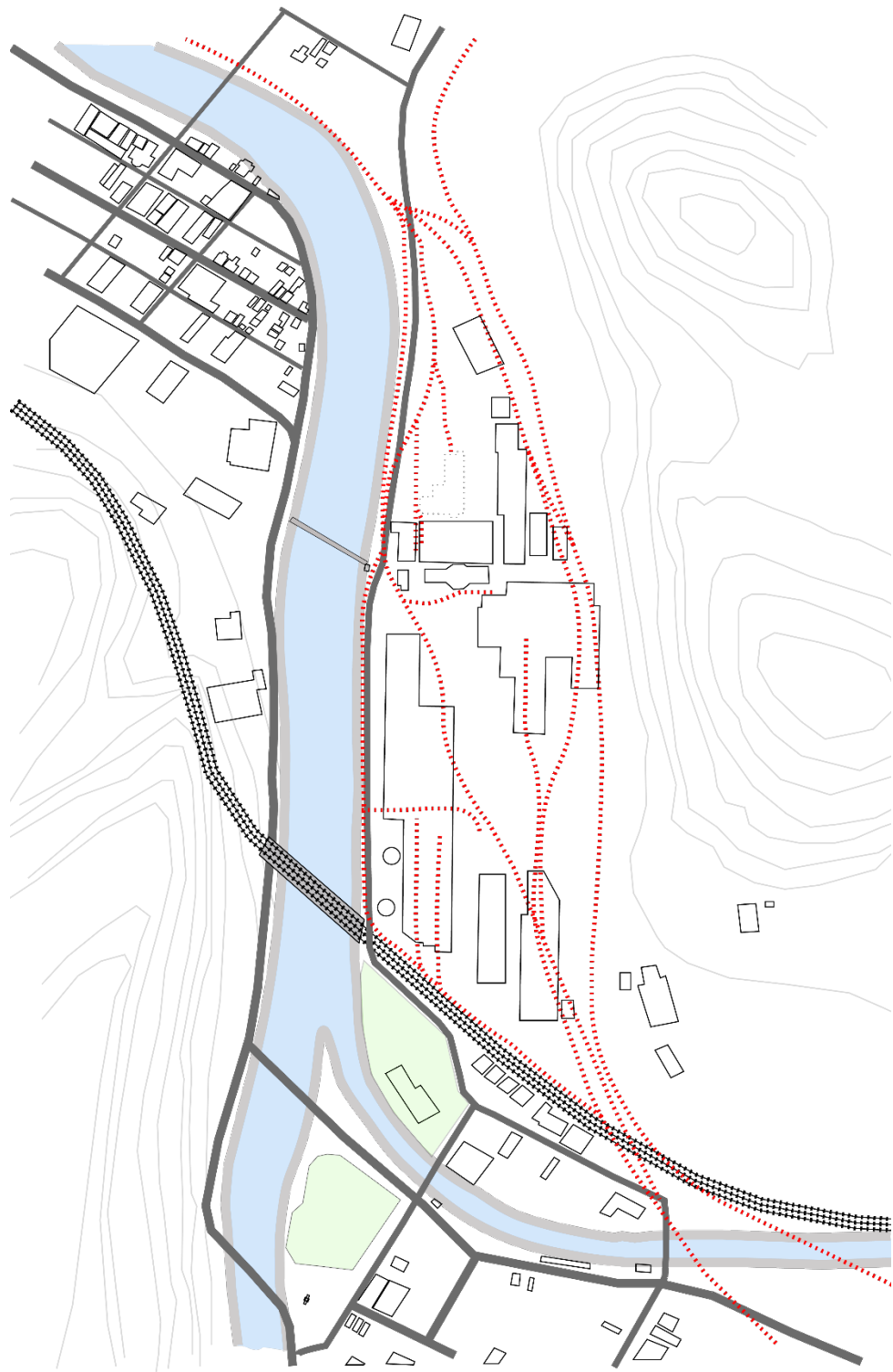


Figure 10 Lower Cambria Navigational Rail System c. 1939

(Source: Author)

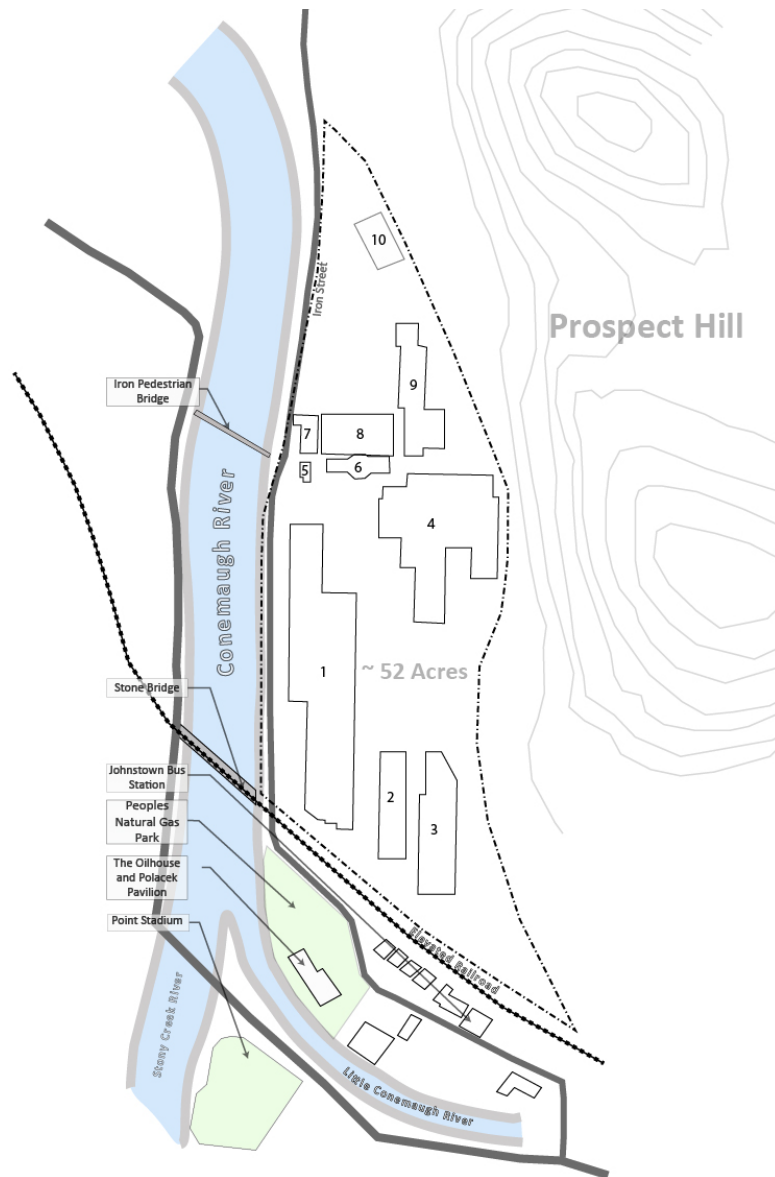


Figure 11 Site Survey – Buildings

(Source: Author

KEY

1. 11" Mill (JWF Building #1), 2. Soaking Pitts (JWF Building #2), 3. Car Repair Shop (JWF Building #3), 4. Merchant Mill and Steel Rail Mill, 5. Rolling Mill Office, 6. Blacksmith Shop, 7. Pattern Shop, 8. Machine Shop, 9. Boiler Shop, 10. Boiler House (Pipeliners Inc).

Current Building Occupancy

As a result of several alternative proposals produced by the National Park Service,⁵¹ the Lower Cambria Site would be purchased by and given to the Johnstown Redevelopment Authority (Chapter 5: Revitalization Efforts) for the management and ownership of the properties. The Authority has since been undertaking an “eclectic mix of redevelopment initiatives”⁵² in efforts to revitalize the building complex. These buildings include; the 11” Mill(Johnstown Welding and Fabrication Building #1), Soaking Pitts (JWF Buidling #2), Car Remair Shop (JWF Building #3), Merchant Mill and Steel Rail Mill, Rolling Mill Office, Blacksmithshop, Pattern Shop, Machine hop, Boiler Shop, and the Boiler House (Pipeliners Inc.) (Figure 13) Three of these buildings were taken over by Johnstown Welding and Fabrication (JWF) Industries who manufacture and fabricate custom metal products. Additionally the Boiler House to the north is currently occupied as storage for Pipeliners Inc. Until recently, many of the other buildings have remained vacant. In March of 2018 a nonprofit organization from New York, Center for Metal Arts, would begin to utilize the Pattern Shop as an educational blacksmithing location. The Center for Metal Arts

⁵¹ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.

⁵² "PROJECTS," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/projects/#1488826284846-bbc7772c-8b8b>.

intends to host classes in blacksmithing and metallurgy for a multitude of skill levels.⁵³ Unfortunately, many of the remaining buildings on the site remain vacant or underutilized. (Figure 13)

⁵³ "Historic Blacksmith Shop in Johnstown to Reopen as School," U.S. News & World Report, , accessed May 09, 2018, <https://www.usnews.com/news/best-states/pennsylvania/articles/2018-01-13/historic-blacksmith-shop-in-johnstown-to-reopen-as-school>.

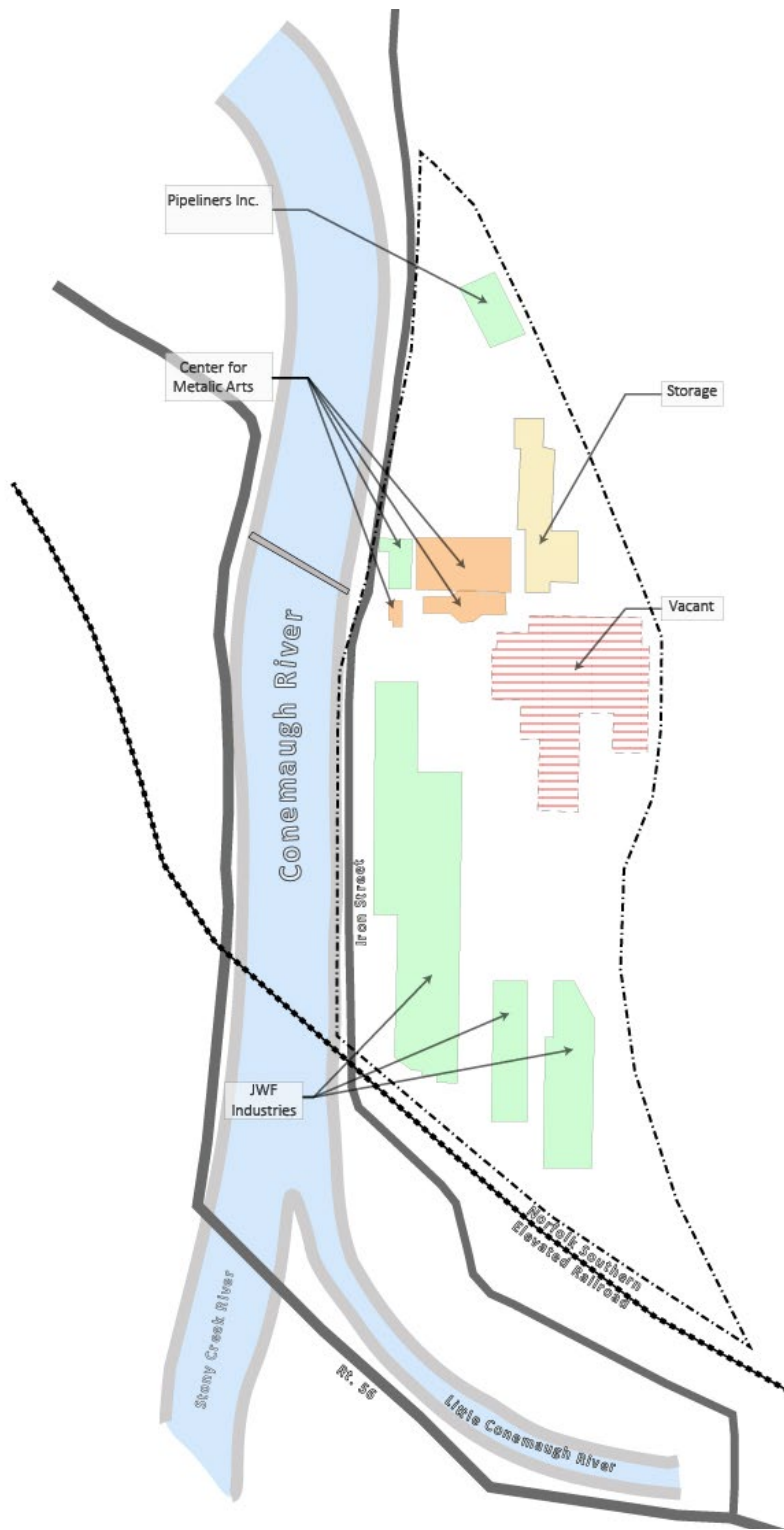


Figure 12 "Building Occupancy"- Lower Cambria

(Source: Author)

National Landmark Buildings

In 1989 the National Historic Register would declare the site and several of its buildings as a Historical Landmark. This status was given primarily because of Cambria Iron's significant role in the development and advancement of the steel industry. Three of the buildings, The Rolling Mill Office, The Pattern Shop, and the Blacksmith shop were determined as "Nationally Significant"⁵⁴ in a *Study of Alternatives* conducted by the National Park Service. In the same study the Machine Shop would be determined as "Compatible with Historically Significant Structures (20th Century)."⁵⁵(Figure 14)

⁵⁴ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 12.

⁵⁵ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service. 12.

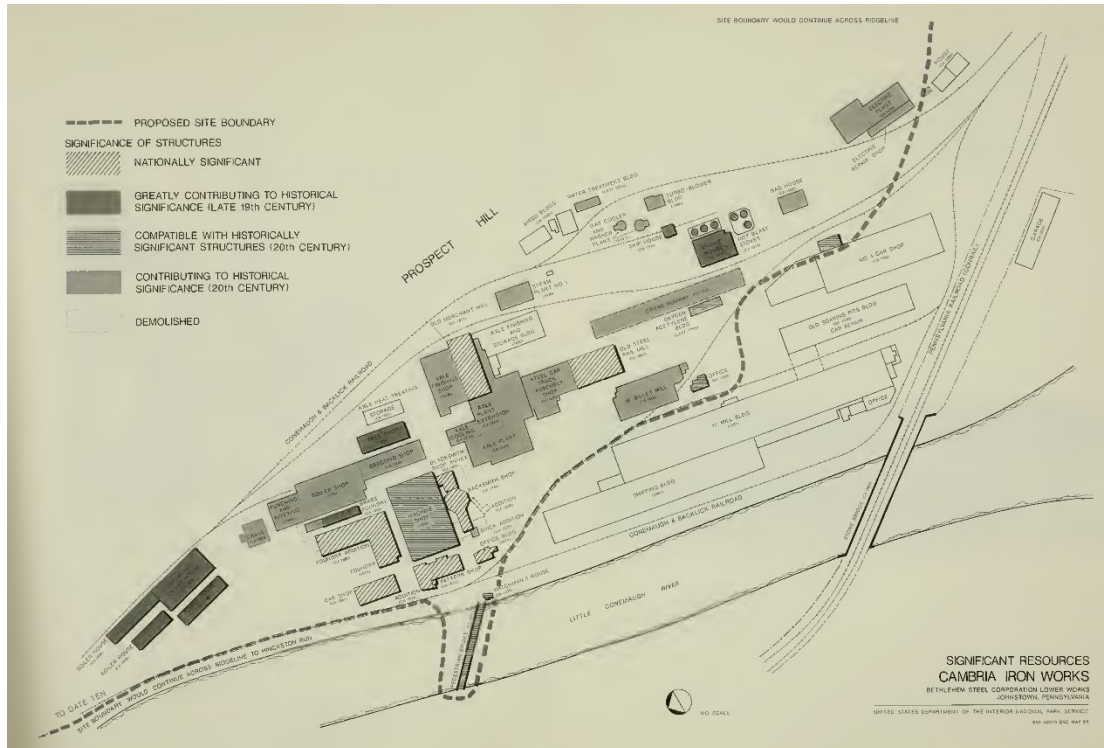


Figure 13 "Significant Resources Cambria Iron Works" Source: Cambria Iron Works Study of Alternatives Johnstown, Pennsylvania.

Blacksmith Shop

The Blacksmith is one of the oldest structures remaining on the site. It was constructed in 1864. Construction of the structure is of masonry brick bearing walls with iron or steel framing for the roof. The single-story building features octagonal core 75 feet in width. To the east and west two wings extend out approximately 70

feet wide by 31 feet deep to the West and 57 feet wide by 43 feet deep to the East. A skewed two-story addition was added to the West wing approximately 1900.⁵⁶

(Figure 15)



Figure 14 Southwest View of Blacksmith Shop

Source: Author

The blacksmith shop would remain in operation until Bethlehem Steel closed its doors. Today the building still houses many machines that were used throughout its lifetime. Two of the machines are the large five-ton steam powered hammers and an

⁵⁶ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.

overhead crane that is supported by the exterior bearing masonry brick structure.⁵⁷ (Figure 16) Although the machinery remains, little is known about the status of their operational capabilities. In 2004 the JAHA obtained funding that allowed for the restoration of the building. the building would undergo stabilization efforts for the brick masonry walls, a roof replacement and replacement of the doors and windows.⁵⁸

⁵⁷ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.

⁵⁸ "Research, Preservation & Special Projects," Johnstown Area Heritage Association, , accessed May 11, 2018, <http://www.jaha.org/about-jaha/about/research-preservation-special-projects/>.



Figure 15 Large steel hammer and Crane Left in Blacksmith shop. Source: Hidden History: Inside the abandoned Cambria Iron Works in Johnstown by Jim Cheney)

Pattern Shop

In 1870 Cambria Iron built the Pattern Shop that is currently to the west of the Machine Shop. (Figure 17) The two-story brick masonry structure is takes the shape of an L with a depth of approximately 81 feet and width of 152 feet. A hip roof sits atop the masonry structure with a singular three-story firehouse tower poking up at the west inside corner of the building. The building would be house machinery used to build patterns used in the foundry. The patterns would be used to mold sand that molten steel would then be poured into giving the iron or steel the shape desired.



Figure 16 West Facade of Pattern Shop

Source: Author

Rolling Mill Office

Four years later, in 1874 Cambria Iron would construct the two and a half story Rolling Mill Office. (Figure 18) Until Bethlehem Steel's closure, the office would remain in use. The building originally featured a cupola atop the tower on the East Elevation. Coherent with the surrounding structures, the building was constructed out of masonry brick. Each floor is held up by arched brick spanning on steel or iron rails. The building features greater architectural expression through the articulation of gothic arched windows and an iron staircase.⁵⁹

⁵⁹ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.



Figure 17 West Elevation of the Rolling Mill Office

Source: Cambria Iron Works Study of Alternatives

Foundry Building

The foundry building would be constructed in 1865 to serve as a space where castings could be made for any assortment of products. The construction of the building was of brick structure with iron trusses for the roof. The building sat adjacent to the Machine Shop approximately 20 feet away. The foot print of the building would measure 70 feet by 140 feet in the east to west direction. In 1880 an addition was made to the building on the east side in a north to south direction with a measurement

of 70 feet by 161 ft, creating an “L” shaped footprint.⁶⁰ After the closure of the mill this building among others would be demolished before the historical society stepped in preventing the destruction of the site.

Machine Shop

The Machine Shop located in the center of the Lower Cambria/Lower Works Site is an over 57 thousand square foot structure that towers over the adjacent structures. (Figure 19) The building takes the form of a cathedral like section with a large center bay as well as two side bays. These side bays have two additional floors to the ground floor that measure 38 feet 7 inches by 240 feet with a central bay measuring 76 feet by 240. The overall dimensions of the building are 160 feet by 240 feet. The structural composition is made up of a steel grid generating individual bays of 38’ 7 inches feet by 20 feet on each wing.⁶¹ (Figure 20) A brick façade was then attached to the structure as well as a concrete roof and a concrete floor. This construction has little insulation to retain heat because of the amount of heat given off from the machinery within the building. (Figure 21)

⁶⁰ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.

⁶¹ United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.

Primary operations within the Machine Shop would involve finished steel products. Due to the enormous size and weight of steel that needed to be handled, the machine shop would house 8–10 ton-32-foot span cranes, 2-10-ton cranes, and 1-50 ton-76-foot span crane. An additional 175 machine tools were housed within the building.⁶² These machines would include lathes, tap and die, metal boring machines as well as many others. Recently the Machine Shop has been used by the Johnstown Symphony Orchestra as a single performance venue. (Figure 22) Otherwise the building remains vacant with little prospect of new program.

⁶² United States. National Park Service. 1988. *Cambria Iron Works: Study of Alternatives: Johnstown, Pennsylvania*. Denver: U.S. Dept. of Interior, National Park Service.



Figure 18 Machine Shop North Elevation

(Source: Johnstown Area Heritage Association)

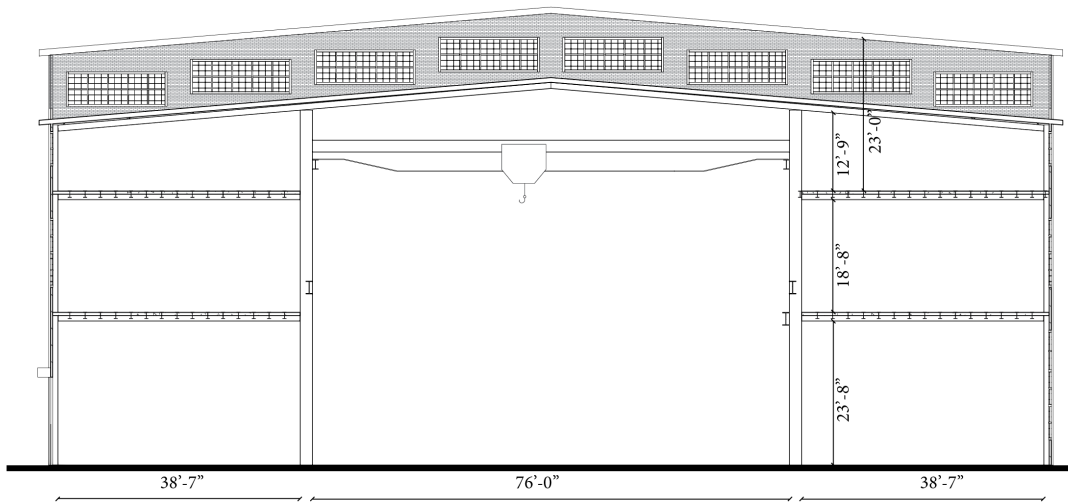


Figure 19 Machine Shop Section

Source: Author

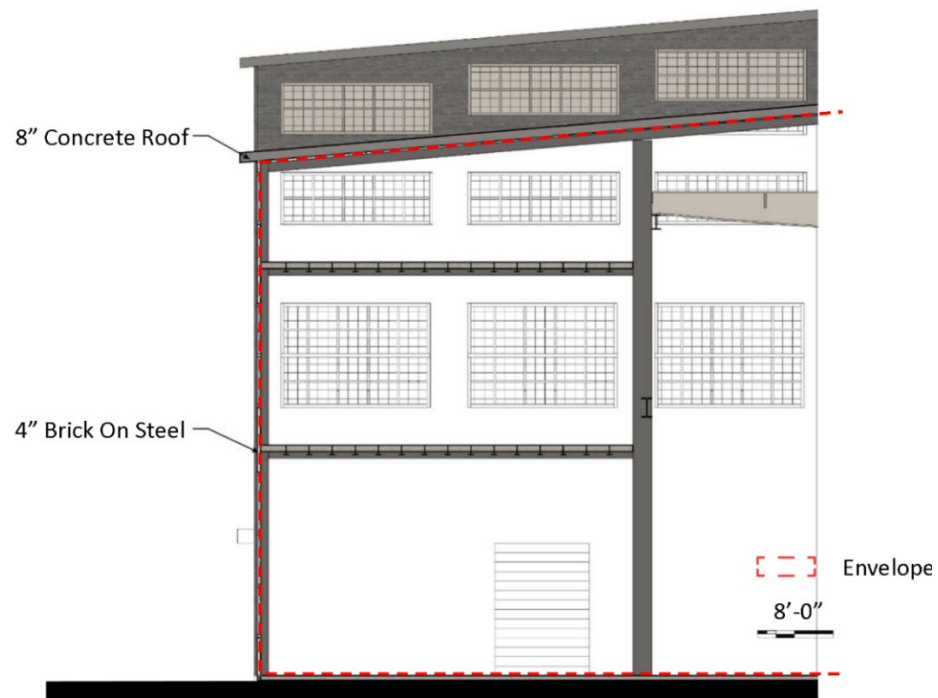


Figure 20 Machine Shop Existing Envelope

Source: Author



Figure 21 Inside of the Machine Shop

Source: Tribdem.com

Chapter 5: Revitalization Efforts

Johnstown Redevelopment Authority

The Johnstown Redevelopment Authority (JRA) was established in 1949 following World War II. The organization was given life through the Urban Redevelopment Authorities Act of 1945. The purpose for Urban Redevelopment Authorities is to “eliminate blight and dangerous conditions.”⁶³ Redevelopment Authorities are generated by the local government yet remain independent of the government. Thus, the responsibility of business dealings and financial obligations lies solely on the organization. The Johnstown Redevelopment focuses on the elimination of blighted residential, recreational, commercial, and industrial areas in addition to focusing on suitable living environments and providing adequate employment opportunities for citizens of Johnstown.⁶⁴

⁶³ "ABOUT US," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/about-us/>.

⁶⁴"ABOUT US," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/about-us/>.

Brownfield Remediation

The Environmental Protection Agency (EPA) conducted studies of the surrounding steel mill sites in 2002. As a result, Johnstown Redevelopment Association (Chapter 5: Revitalization Efforts) in conjunction with JAHA would be given a \$200 thousand-dollar pilot grant for the remediation of the steel mill/brownfield sites. This grant along with other state and federal funding would amount to \$6 million-dollars. In turn these funds were dedicated to the remediation of these sites for them to be returned to use.⁶⁵

Several buildings located on the Lower Cambria/Lower Works site would be remediated, removing asbestos from the buildings. Additional remediation was needed for the soils that were contaminated with Volatile Organic Compounds (VOC'S) and lead remnants. To do so, the site soil was first removed, then encapsulated, and replaced with new, fresh soils. Both buildings and the site have been removed of contaminants and have been labeled by the EPA as "Remediated."

66

⁶⁵ *EPA Region III Brownfields Pilot Best Practices*, technical report (Environmental Protection Agency).

⁶⁶ *Cambria Iron Works*, Case Study, accessed May 10, 2018, [https://www.cmu.edu/steinbrenner/brownfields/Case Studies/pdf/cambria iron works case study.pdf](https://www.cmu.edu/steinbrenner/brownfields/Case%20Studies/pdf/cambria%20iron%20works%20case%20study.pdf).

Johnstown Urban Greenway Trail

The Johnstown Urban Greenway Trail was completed in January of 2004. This project was facilitated by joint efforts from the Johnstown Redevelopment Authority and the Army Corps of Engineers. The .8-mile stretch follows Iron street from the its intersection with St. Johns Street to the Footbridge accessing the Lower Cambria/Lower Works site. The trail is to be an extension of the 11-mile Path of the Flood Trail that follows the 1889 flood path beginning at the Southfork Dam in Ehrenfeild Park and terminating at the Johnstown Flood Museum.⁶⁷(Figure 23)

⁶⁷ "Path of the Flood," Trans Allegheny Trails - Hiking and Biking Trails in SW PA, , accessed May 11, 2018, <http://www.transalleghenytrails.com/trails/path-of-the-flood.aspx>.

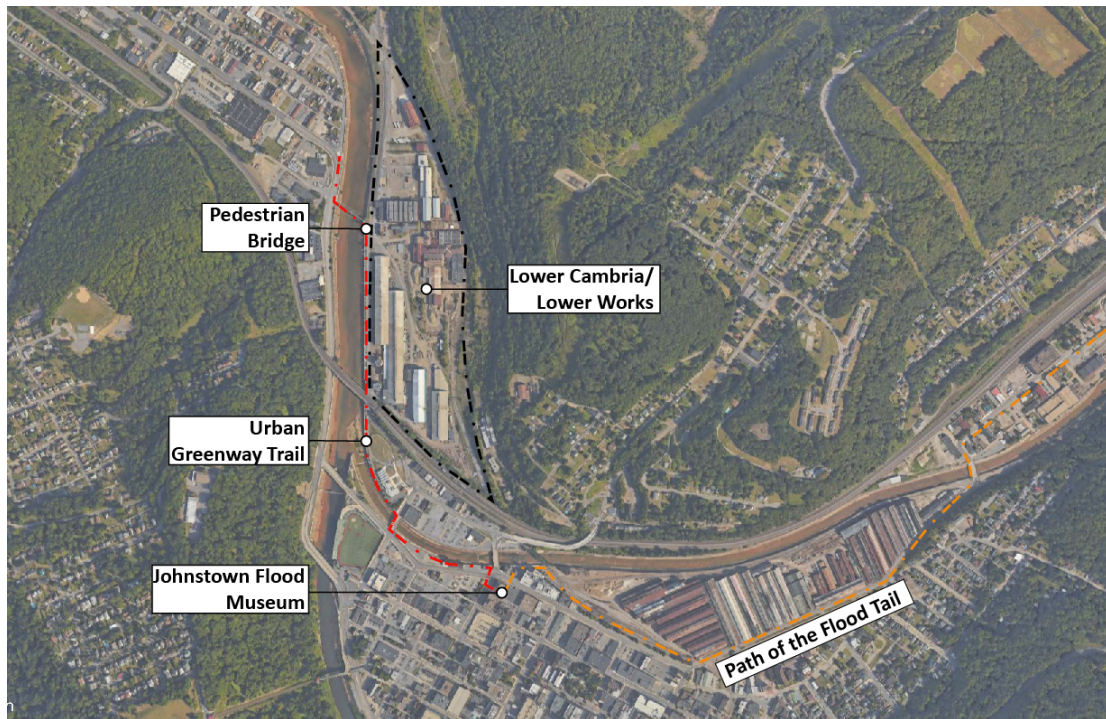


Figure 22 “Urban Greenway Trail”

Source: Google Earth with Author Overlay

Johnstown Renaissance Project

The Johnstown Renaissance Project took place between 1998 and 2004. The project would focus on three structures, the Cambria County War Memorial Arena, The Frank J. Pasquerilla Conference Center, and the Intermodal Transportation Center comprising the gateway to Johnstown. The Intermodal Transportation Center is a 600-space parking garage connected to the public transportation system that services the Conference Center, War Memorial Arena (Figure 24) as well as the downtown

district.⁶⁸ The work completed to the Cambria County War Memorial consisted primarily of renovations towards infrastructure and seating. The renovations would allow the arena to continue drawing crowds and ensure its continuing success. The last of the three buildings is the Frank J. Pasquerilla Conference Center completed in 2003. (Figure 25) The center was constructed using both state and private funds. The conference center provides banquet, exhibition and meeting spaces meeting the needs of the region.⁶⁹

⁶⁸ "PROJECTS," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/projects/#1488826284846-bbc7772c-8b8b>.

⁶⁹ "PROJECTS," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/projects/#1488826284846-bbc7772c-8b8b>.



Figure 23 “Cambria County War Memorial”

Source: RoamingTheRinks.com



Figure 24 “Frank J. Pasquerilla Conference Center

Source: Foreman Group

Greater Johnstown Regional Technology Park

The Greater Johnstown Regional Technology Park constructed in 2008 is a state of the art complex funded by the JRA alongside Conemaugh Health Systems, the leading employer for the region. (Figure 26) The new complex redeveloped a former inner-city brownfield along the Stoney Creek River, turning it into not only new buildings but also focusing on the incorporation of sustainable greenspace. This greenspace provided the JRA with the opportunity to create the Tech Park Riverwalk. Focused on Economic diversification, three main tenants utilize the space Conemaugh Health Systems, Northrop Grumman, and the Department of Labor – Division of Coal Mine Worker's Compensation.⁷⁰

⁷⁰ "PROJECTS," Johnstown Redevelopment Authority, , accessed May 11, 2018, <http://johnstown-redevelopment.org/projects/#1488826284846-bbc7772c-8b8b>.



Figure 25 “Greater Johnstown Regional Technology Park” Source: Modern Art and Plate Glass Portfolio

Johnstown Area Heritage Association (JAHA)

The Johnstown Area Heritage Association (JAHA) is a non-profit and membership-based organization that seeks to preserve and present the history of Johnstown.

Several properties throughout the city have been purchased or given to JAHA in a way to preserve their historical significance. The organization provides educational

experiences through museums as well as organizes multiple events for the city of Johnstown.⁷¹

Johnstown Train Station

The Pennsylvania railroad Station was built between 1915 and 1916 to replace a mid-19th century station that could not facilitate the influx of passengers at the time.

(Figure 27) The building was donated to the organization in 2010 by Carole Furst Gigliotti and Harvey and Katherine Supowits. In 2016 the organization began the rehabilitation of the building. Additionally, Amtrak has completed Americans with Disabilities (ADA) accessibility required upgrades. Currently the organization is advocating for increased passenger rail services to Johnstown.⁷²

⁷¹ "JAHA's Mission," Johnstown Area Heritage Association, , accessed May 18, 2018, <http://www.jaha.org/about-jaha/about/jahas-mission/>.

⁷² "Research, Preservation & Special Projects," Johnstown Area Heritage Association, , accessed May 18, 2018, <http://www.jaha.org/about-jaha/about/research-preservation-special-projects/>.



Figure 26 1915-16 Johnstown Train Station

Source: Dave Sutor

Johnstown Area Heritage Discovery Center

The Johnstown Area Heritage Discovery Center is an adaptive reuse project. The original building facilitated the Germania Brewery that operated until 1919. Due to prohibition, the building would fall into several hands until it was purchased in 1993 by JAHA. The new Johnstown Area Heritage Discovery Center would be completed in 2009.⁷³ (Figure 28) The building is home to several exhibit spaces. Two permanent

⁷³ "Research, Preservation & Special Projects," Johnstown Area Heritage Association, , accessed May 18, 2018, <http://www.jaha.org/about-jaha/about/research-preservation-special-projects/>.

exhibit spaces in the museum are; America: Through Immigrant Eyes and the Iron and Steel Gallery. America; Through Immigrant Eyes takes visitors through the experience of 19th century immigrants who find employment and a new home in Johnstown, Pennsylvania. The Iron and Steel Gallery is a three-story space that features a small theater in the center that plays a historical film showing depicting the life and historical significance of steel and iron in Johnstown. Circulating the space is a ramp that exhibits artifacts from the Cambria Iron and Bethlehem Steel Industry.

(Figure 29)



Figure 27 Johnstown Heritage Discovery Center

Source: Johnstown Area Heritage Association



Figure 28 Iron and Steel Gallery

Source: Johnstown Heritage Discovery Center

Chapter 6: Program Study

Adaptive Reuse

For buildings to continue their lifespan, it is in almost all cases buildings will find themselves programmatically obsolete. This is to say that the initial use of the building will either require change, adaptation or is found to be obsolete altogether. Many of these buildings thus are underutilize, vacant or destroyed. To prevent destruction and preserve the buildings, a new life must be given through the implementation of new program. Subsequently reflecting upon the intervention that is taking place, the expectation must be that the new programmatic solution will follow its own life and death cycle. In turn the new intervention should implement design techniques and systems that will allow for further adaptations of the building.

Case Study: Hughes Warehouse Adaptive Reuse by Overland Partners

This project consists of a 1918 warehouse located in San Antonio, TX that was adaptively reused into a studio space. The design tactic utilizes meeting spaces as its primary organizational space for the ground floor. (Figure 30) Throughout the rest of the studio collaboration promoted with an open office floorplan. Collaborative spaces are organized throughout the building, formed by the structural grid and utilizing the existing clerestory windows for daylight. At the main entrance the building was carved out leaving only an exterior wall with loading dock doors creating an entry

court as a threshold for the building.⁷⁴ The Hughes Warehouse provides a good example as an adaptive reuse project that retains characteristics of the original building that also provides a programmatic design solution that fosters collaborative work. (Figure 31)



Figure 29 Hughes Warehouse Adaptive Reuse – Ground Floor Plan Source: Overland Partners

⁷⁴ "Hughes Warehouse Adaptive Reuse / Overland Partners," ArchDaily, September 21, 2014, , accessed May 17, 2018, <https://www.archdaily.com/548804/hughes-warehouse-adaptive-reuse-overland-partners>.



Figure 30 Hughes Warehouse Adaptive Reuse – Entry Court

Copyright: Scott Adams AIA.

Incubator Spaces

Incubator spaces come in primarily two forms, business incubators and makerspaces. The purpose for these spaces is to provide start up spaces that allow individuals or small companies to foster their ideas into large scale businesses. Funding for these spaces can be provided through large companies that look to invest and incubate promising businesses. Alternately, it has become popular for cities, states and even the federal government to provide funding and assistance in the development of these spaces. The city, state, and federal investments are in the expectation that these spaces will foster businesses to the point at which large scale manufacturing and

employment can be achieved, improving and advancing specific neighborhoods or cities within themselves.⁷⁵

Makerspaces

Makerspaces provide machinery to small startup companies that would otherwise be unable to acquire or purchase the machinery. Access to these spaces is rented or included as a part of a membership fee. These types of spaces take form from two types of making, “Clean” or “Dirty.” The latter of which refers to spaces that provide machinery such as saws, drills, open CNC machines, lathes etc. that produce dirt and debris from production processes. Alternatively, the “Clean” or “Hackerspace” provides amenities like 3D printers, soldering equipment, fast internet services, and other provisions that promote tech development such as robotics or computer hardware that require a clean environment to operate. This type of space often provides ample space for collaboration between the members of its community.⁷⁶

⁷⁵ National League of Cities, "How Cities Can Grow the Maker Movement," , 2016, accessed May 5, 2018, <https://www.nlc.org/resource/how-cities-can-grow-the-maker-movement-report>.

⁷⁶ National League of Cities, "How Cities Can Grow the Maker Movement," , 2016, accessed May 5, 2018, <https://www.nlc.org/resource/how-cities-can-grow-the-maker-movement-report>.

According to *Making Makerspaces: Creating a Business Model* space distribution can be broken down into several different spaces as a part of the program. These spaces are listed as⁷⁷:

- Fire Lanes – Estimate 25-35% of the floor area devoted to code regulated fire egress.
- Welcoming Areas – this space includes Front desks or sign-in Kiosks
- Social/Food Areas – Spaces for members to socialize and eat.
- Dedicated Classrooms/Conference Rooms – These spaces offer opportunity for educational programming to take place that can provide alternate sources of revenue.
- Workshops – A dedicated space for tools. Providing 300 to 500 Sqft. To a singular craft type and approx. 75-150 Sqft. Per person.
- Rental Studios – Provide Private Spaces for Artists to work.
- Storage Space – Members will need a way to keep their projects. These spaces can take the form of shelved units or even larger spaces for pallet storage.
- Gallery/Display Area- These spaces provide spaces for craftsmen and artists to display their work.

⁷⁷ "Making Makerspaces: Creating a Business Model | Make:," Make: DIY Projects and Ideas for Makers, June 04, 2013, , accessed May 17, 2018, <https://makezine.com/2013/06/04/making-makerspaces-creating-a-business-model/>.

- Retail Area- These areas provide space for the makerspace to sell materials goods and services to the members. \

Business Incubator

Business Incubators are spaces that provoke communal collaboration amongst small startup companies. Forbs Contributor J.J. Colao defined business incubators as “Startup hubs [that] offer expert membership, resources like office space, legal counsel, and even seed money.” As is defined, business incubators provide the start-up companies with more than just office space but with several amenities that are often found in larger companies but are out of the financial reach of the start-ups. Many of these projects include spaces like lounges, printing rooms, open office spaces, accessible conference rooms, classrooms, tech centers and few private offices. An example of this is the Launch Factory building in Charlette, North Carolina.

SecureEdge a wireless technology-based company along with other investors chose to develop a business incubator space in the 80-year-old General Dyestaff Building. The new layout design features an open plan with several collaborative and relaxed working spaces throughout the building. (Figure 32) Working surfaces are also provided that are coated with static free finishes to allow members to work on tech projects. The building also offers multiple dedicated desk and dedicated office spaces

at addition membership costs.⁷⁸



Figure 31 Launch Factory Open Work Space

Source: Scott Jensen

Museum

The museum typology is often found as a part of adaptive reuse projects. Industrial warehouses and buildings are often chosen to be reused for museum spaces when the building is no longer in operation but maintains historical significance. The large open spaces found in these buildings provide ample opportunity to the programmatic

⁷⁸ Scott Jensen, "Tech CEO and Non-Profit Executive Launching Charlotte's First Upscale Co-Working Space," Charlotte Stories, February 06, 2017, , accessed May 17, 2018, <http://www.charlottestories.com/local-tech-company-launching-charlottes-first-high-end-co-working-space/>.

requirements of a museum. With little interruptions, the museum program is free to curate the spaces within the building to meet its needs. This programmatic solution could undoubtedly respect the historical nature of the site. Additionally, the current programmatic operation of the Blacksmith Shop would allow a terrific opportunity for a museum program to exhibit the historical use and function of a blacksmith shop. This typology would respect the historical nature of the site and would most likely reflect the nature and operation of the mill similar to the one at the Johnstown Heritage Museum reviewed in chapter 5. Ultimately, the museum would provide the site with an attraction that would bring people to the site.

Greenspace and Water Connection

As mentioned in chapter 5, the Johnstown Urban Greenway lies between the Lower Cambria/Lower Works Site. Although this begins to generate a connection between to the Conemaugh River edge, a need for the site to connect with the river requires further development. A disconnect is formed by Iron Street between the site and the green way. Advancing this connection between the water edge and the site will provide it with important pedestrian friendly access. For this and the design of the exterior greenspace two case studies will assist, the Bethlehem Steel Stacks in Bethlehem, Pennsylvania, and Gas Works Park in Seattle, Washington.

Bethlehem Steel Stacks

Bethlehem Steel Stacks in Bethlehem, Pennsylvania is the former home of the Bethlehem Steel Corporation. Akin to Johnstown's situation, the city of Bethlehem, Pa was left with a vast majority of brownfield space from the steel mill operation. Through government, private, and non-profit investments, a 9.5-acre revitalization project was developed.⁷⁹ The introduction of a new casino would produce tax revenue that was then used as a means to develop the park. For this project the development authority turned to WRT LLC. For designs, the existing Stackhouse was turned into a new visitor's center that access the existing blast furnace stacks and catwalk. Additionally, two new buildings were constructed. The ArtsQuest building, that fosters year-round arts education and performances as well as several theaters and two restaurants. The second building PBS39 is home to the local news station. The majority of the outdoor space was designed for the Levitt Pavilion. (Figure 33) This space is an outdoor concert venue providing lawn seating for 2,00 people that is backdropped by the Blast furnaces. Throughout the summer free concerts are held as

⁷⁹ "Revitalizing the Former Bethlehem Steel Plant in PA," The Intersector Project, , accessed May 18, 2018, http://intersector.com/case/steelstacks_bethlehem/.

well as other concert series. (Figure 29)



Figure 32 Levitt Pavilion

Source: ArtsQuest.org

Bethlehem Steel Stacks is an ideal model for an existing steel mill that can be revitalized by introducing new buildings and outdoor programs. It successfully attracts 1.5 million visitors per year.⁸⁰

⁸⁰ "SteelStacks Arts and Cultural Campus," WRT Design, , accessed May 18, 2018, <http://www.wrt-design.com/work/steelstacks-arts-and-cultural-campus75>.

Gas Works Park Seattle, Washington

Designed by Richard Hagg in 1971, the twenty-acre abandoned gas power generation plant was adapted into one of the most heavily used parks in the Seattle Parks and Recreation system and is considered a precedent-setting project. (Figure 34 & 35) This precedent sets two themes for the park, the first being how we treat existing infrastructure in site context, and the second was the process of brownfield remediation. For this thesis, the focus will be on the treatment of existing infrastructure. As for the latter, the Lower Cambria/Lower Works has already been remediated as previously discussed.

Hagg approached the site with a unique editing process choosing which infrastructural elements remain as reminders of the past. The editing process of these elements was prescribed by the notion of “Genius Loci” (Spirit of Place).⁸¹ Leaving behind elements such as the turbines, scrubbers, generators, even Kite Hill the sixty-foot mound of contaminated soil, left the place with a connection to the historical context that was there.⁸² The site additionally plays on the notion of Life, Death, and

⁸¹ "Gas Works Park: Seattle's Strangest Park Has an Equally Weird History," An Image., , accessed May 18, 2018, <http://citylivingseattle.com/Content/News/City-News/Article/Gas-Works-Park-Seattle-s-strangest-park-has-an-equally-weird-history/22/167/90414>.

⁸² William S. Saunders et al., Richard Haag: Bloedel Reserve and Gas Works Park (New York: Princeton Architectural Press, 1998).

rebirth, as the infrastructure continues to rust and decay the remnants are contrasted by the lush greenery surrounding the site.



Figure 33 Aerial View of Gas Works Park

Source: Richard Haag Associates



*Figure 34 Stacks and Remnants: Gas Works Park*Source: Richard Haag Associates

Chapter 7: Initial Program and Massing Investigations

Utilizing the previous chapter 6 investigations into programmatic solutions, three program studies were conducted. Although the precedent studies lend a hand in the development of the site, the program interventions must respond to site specific strengths and opportunities. Additionally, the expectation of the intervention will be that the programmatic solution shall Build Community, Boost the Economic status of Johnstown, remain environmentally conscious, and respect the historical context of the site.

In response to the site conditions, investigations are also made in relations the program of the entire site as well as the connection made to the Johnstown Urban Greenway. (Figure 36) Additionally these investigations will consider ways in which the surrounding urban fabric can infiltrate the site. (Figure 37)

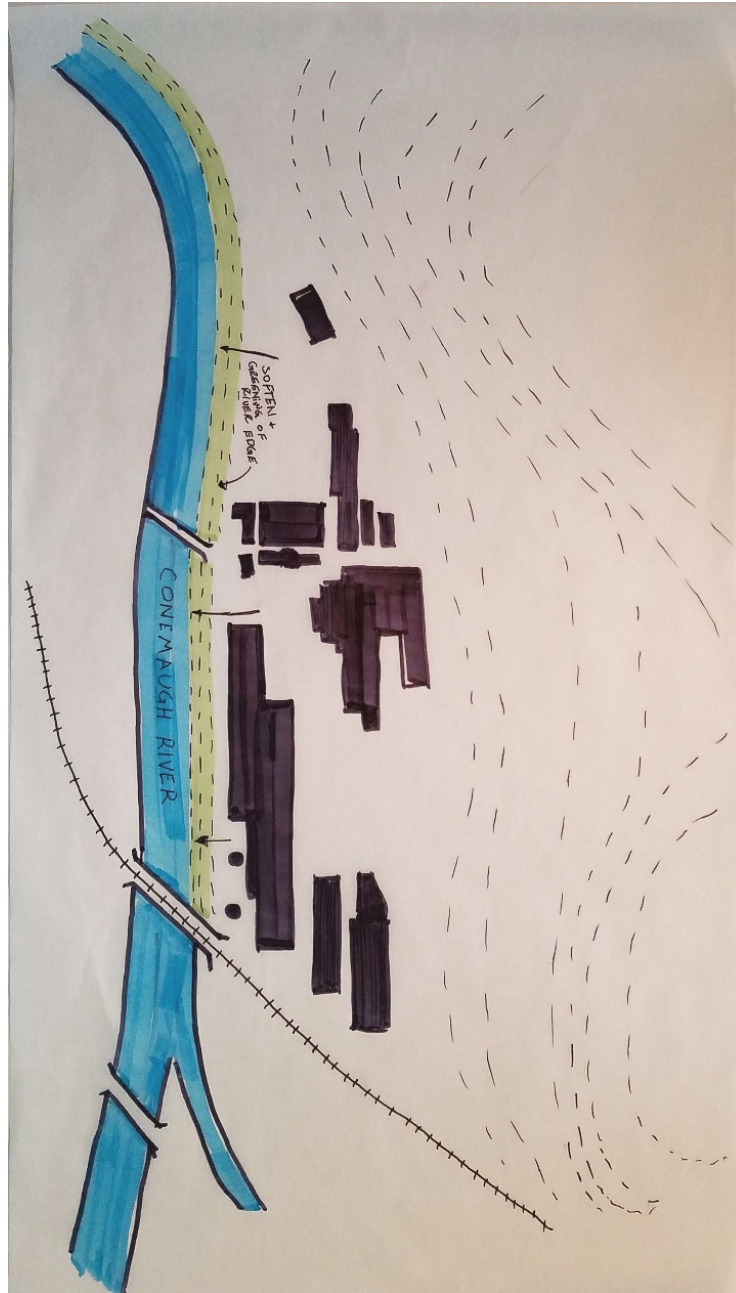


Figure 35 Green Connection to Riverfront (Source: Author)



Figure 36 Bridging the Urban Fabric (Source: Author)

The Machine Shop

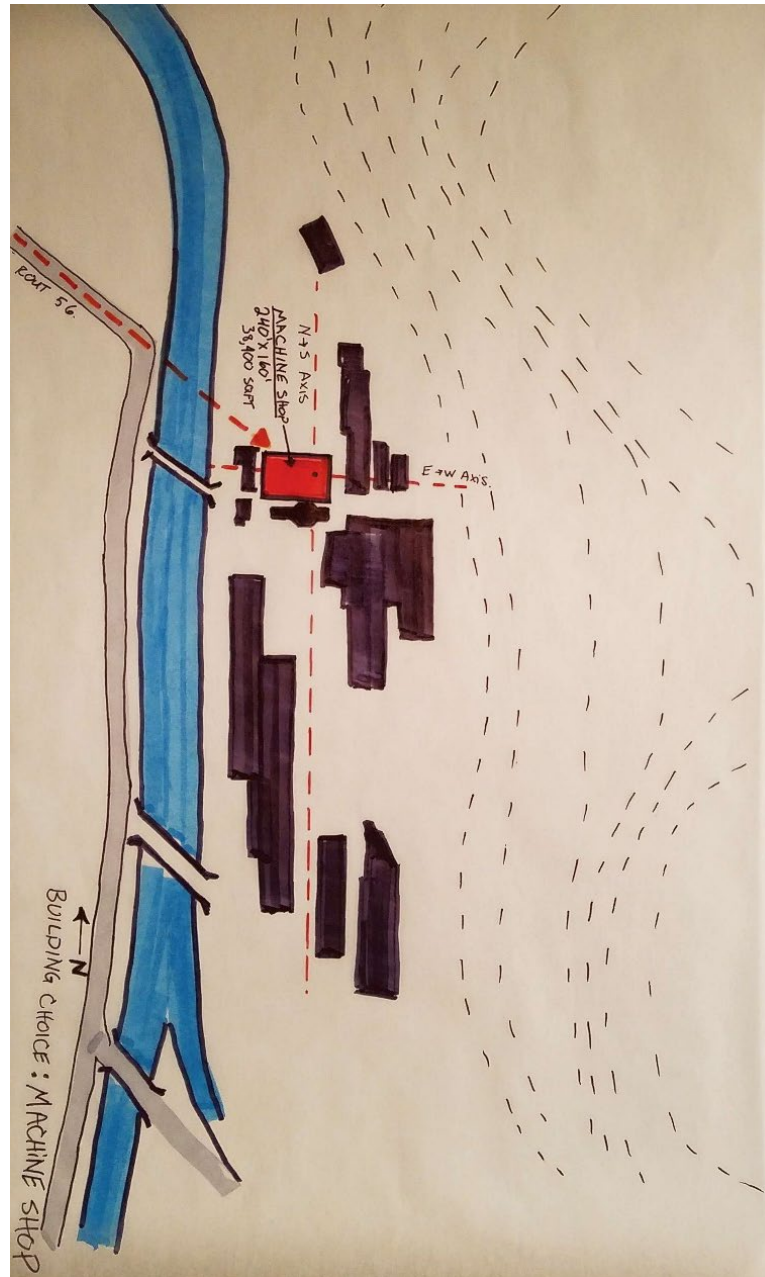


Figure 37 Initial Building Diagram

Source: Author

Before programmatic investigations can be conducted, an initial building needs to be chosen. (Figure 38) Although the intervention will not be limited to a singular

building on the site, it is important for initial purposes to establish a building that can facilitate all three programs. Looking at criteria such as, Historical significance, available space, site placement, and visibility from Rout 56 a prominent city access highway.

As previously discussed in chapter 4, the machine shop provides 76 thousand Square feet of available space including two floor levels. This open space provides a malleable pallet for a programmatic intervention. When traveling south on Route 56 the Machine shop serves as a visual terminus across the Conemaugh river as the road turns to follow the river. (Figure 39) As shown in Figure 28, the Machine Shop is situated at the center of both axis for the site. This situates the building as the central structure of the site. Although the Machine Shop does not hold a position as a National Historic Landmark, it does however fall within the site boundary of the Lower Works/ Lower Cambria Historic Place. Meeting the criteria for initial programmatic studies, the Machine Shop was chosen as the site's catalyst space for these initial studies.



Figure 38 Machine Shop Terminus (Source: Google Earth)

Scheme 1 – Museum Program

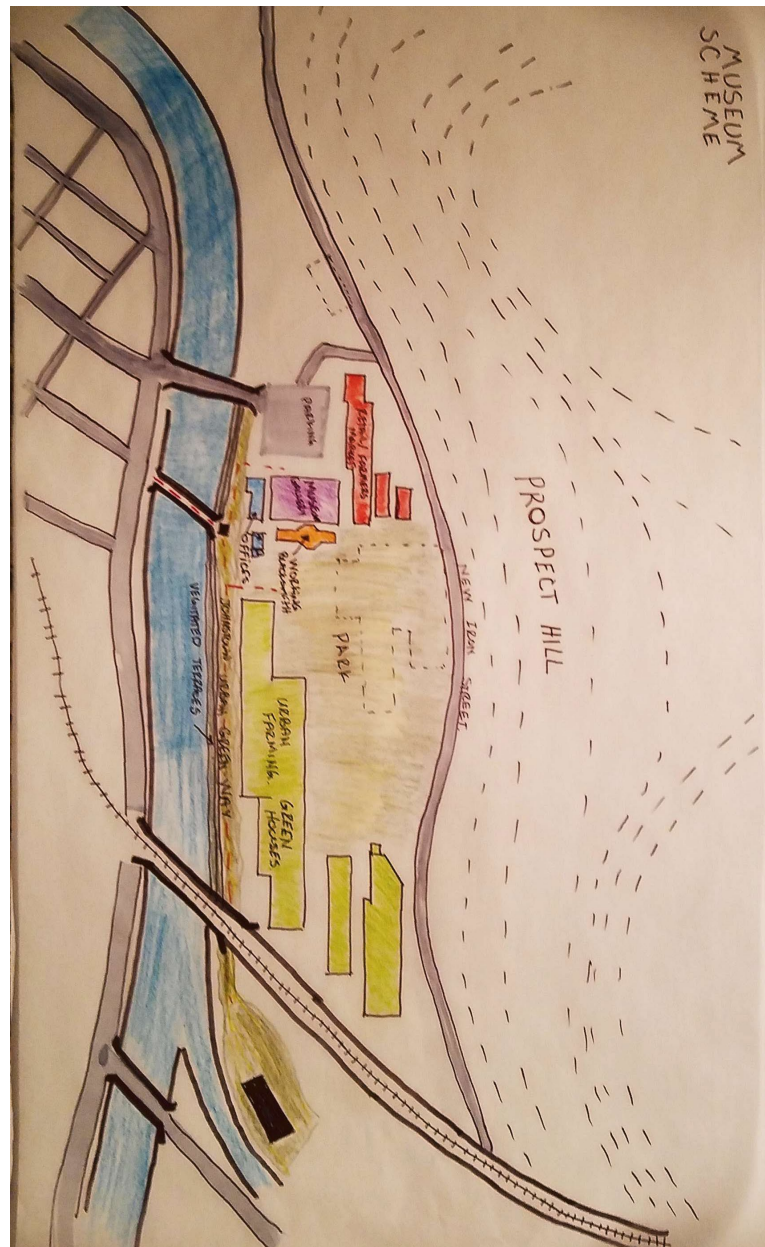


Figure 39 Museum Scheme Site Diagram. Solution

(Source: Author)

Museum Site Program

This scheme initially re-routes Iron Street to follow a unused preexisting rail line allowing for the site to extend to the Johnstown Urban Greenway and the Conemaugh Riverfront. This extension provides a more pedestrian friendly access route from Natural Gas Park, removing the awkward and encroaching placement of Iron Street. The river edge is then softened by green terraces that provide a softer river edge appearance. Additionally, a new bridge is extended from Rout 56 to the site giving it a more direct and easy access point.

Programmatically, the Museum would be complimented by the Blacksmith shop being returned to a similar functionality that would adhere to its historical program. The Pattern Shop and the Rolling Mill Office would then be repurposed into office spaces that serve the Museum itself. The southern buildings currently housing JWF Industries would be repurposed as urban agricultural greenhouses to serve the Johnstown Community. In response to the urban agriculture, the Boiler Shop is reused as a shell structure to house farmers markets and other community events or festivals. The Merchant Mill and Rail Shop is removed from the site, providing greenspace and an area for further development.

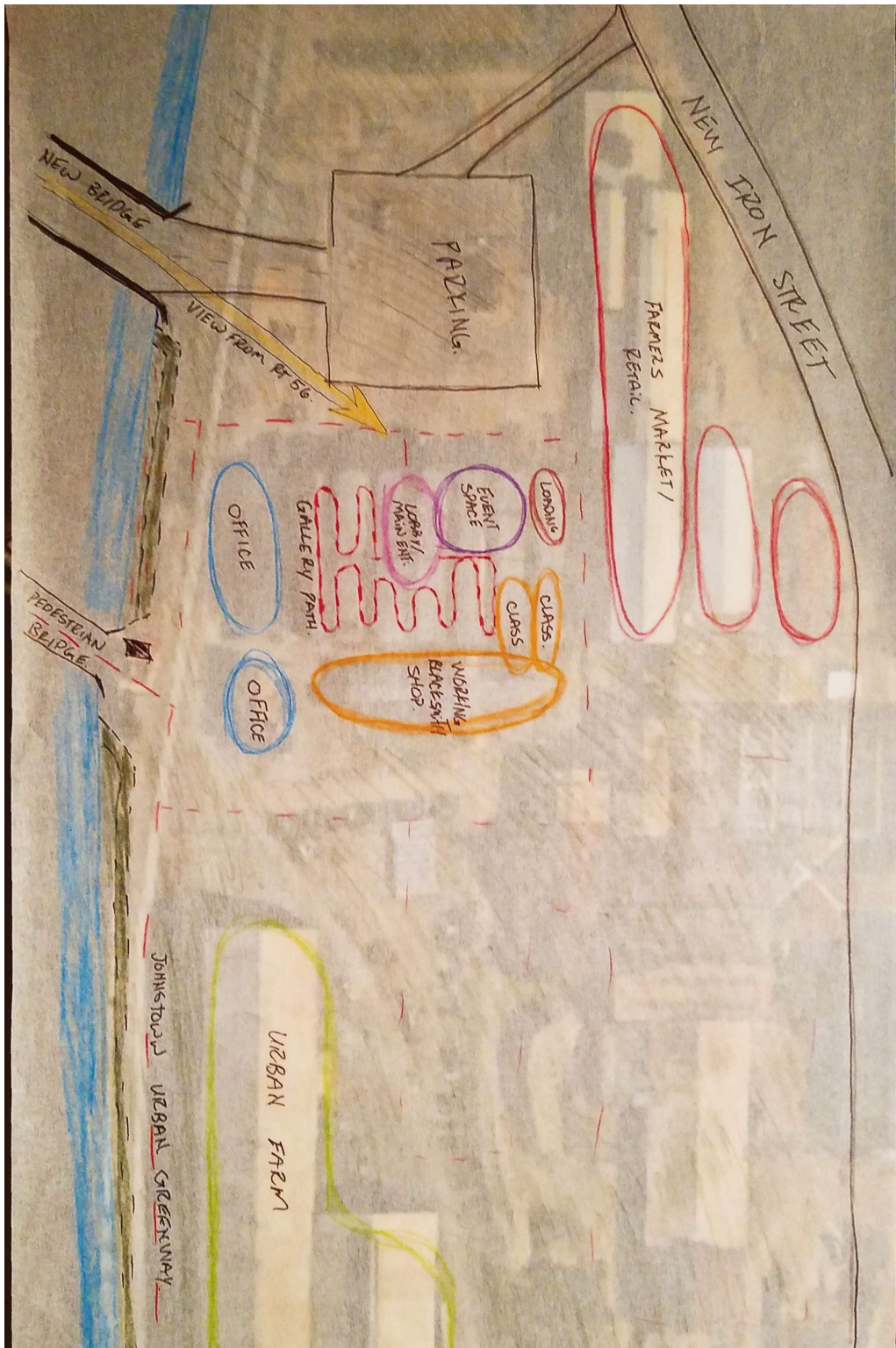


Figure 40 Museum Program Solution

(Source: Author)

Museum Program Solution

The main entrance for the program is located centrally on the north side of the building. (Figure 42) The Lobby/Entrance space is wrapped by gallery space to the West and South of the building. to the East the Lobby opens into a large event space. Additionally, Two Classroom Spaces are provided that connect between the Museum and the Blacksmith Shop.(Figure 43)

Conclusions

Introducing a Museum program will respect and convey the historic value of the site and the buildings upon it as well as build community ties within Johnstown.

Additionally, introducing new greenspace will provide an opportunity to enrich the atmosphere of the site while introducing a natural cycle of plant life that has not been on the site for over a century. The museum may in some light boost the economy of Johnstown but can be reflected in its effects to that of the existing museums within the city.

Scheme 2 – Makerspace

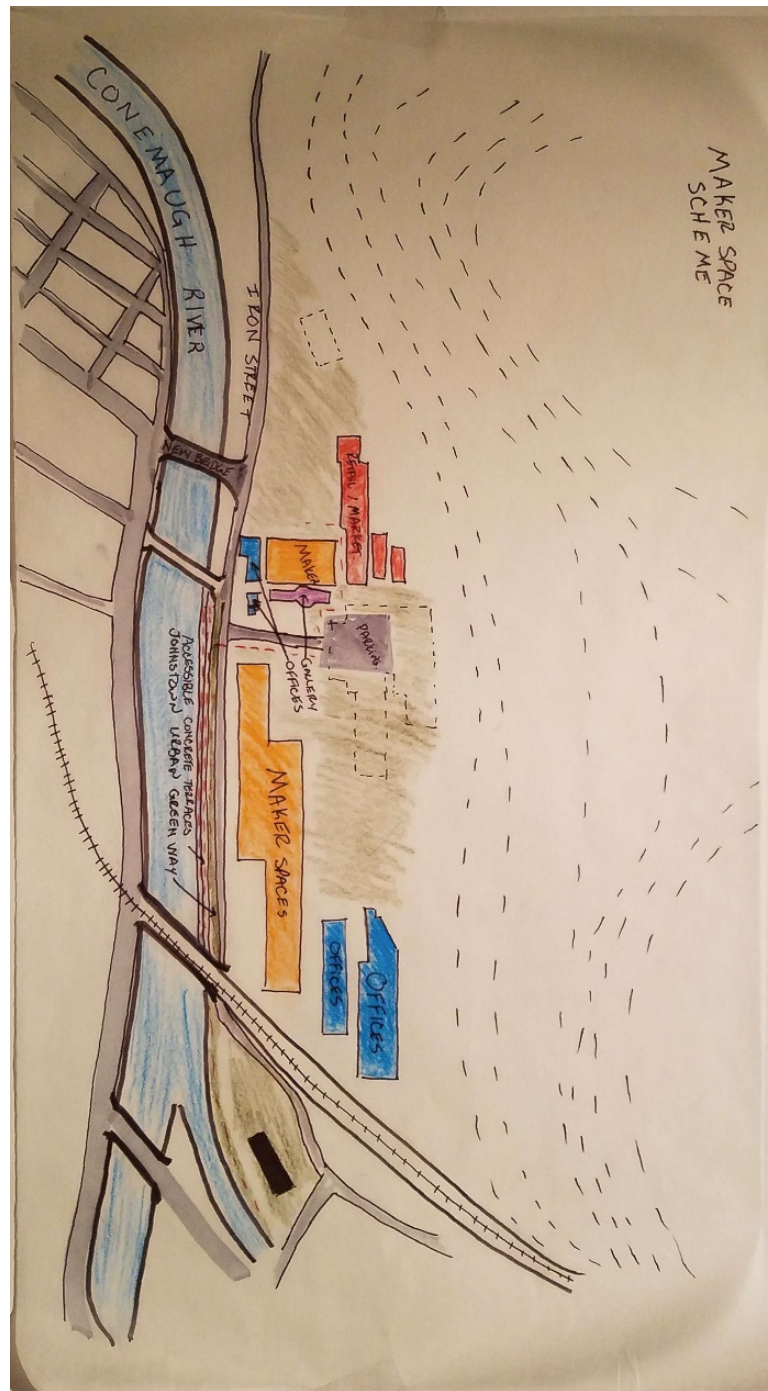


Figure 41 Makerspace Site Scheme Source: Author

Makerspace Site Program

This scheme retains the location of Iron Street and provides a new bridge as an access point from Route 56. Along the River edge accessible concrete terraces are introduced to provide pedestrians from the Johnstown Urban Greenway a connection to the Conemaugh River. (Figure 43) Reforming yet maintaining the concrete nature will allow the area to act as it has in high water conditions while giving access to the water. Open space to the North of the Makerspace (Machine Shop) provides an open area for the occupants of the buildings that could later be developed further according to the needs of the site. Additionally, the removal of the Merchant Mill and Rail Shop provides ample Greenspace as well as space for parking.

The program of the site focuses on the Makerspace as a catalyst that utilizes the Blacksmith Shop as a gallery entrance. The Pattern Shop and Rolling Mill Office are programmed as rentable office space that is facilitated by the Makerspace. The boiler shop provides opportunity for a retail/market place where the members of the Makerspace community can display and sell their products and crafts. As the Makerspace grows, the JWF buildings can be reprogrammed into larger Makerspaces and support offices for companies that begin a larger scale production than can be facilitated by the initial makerspace.

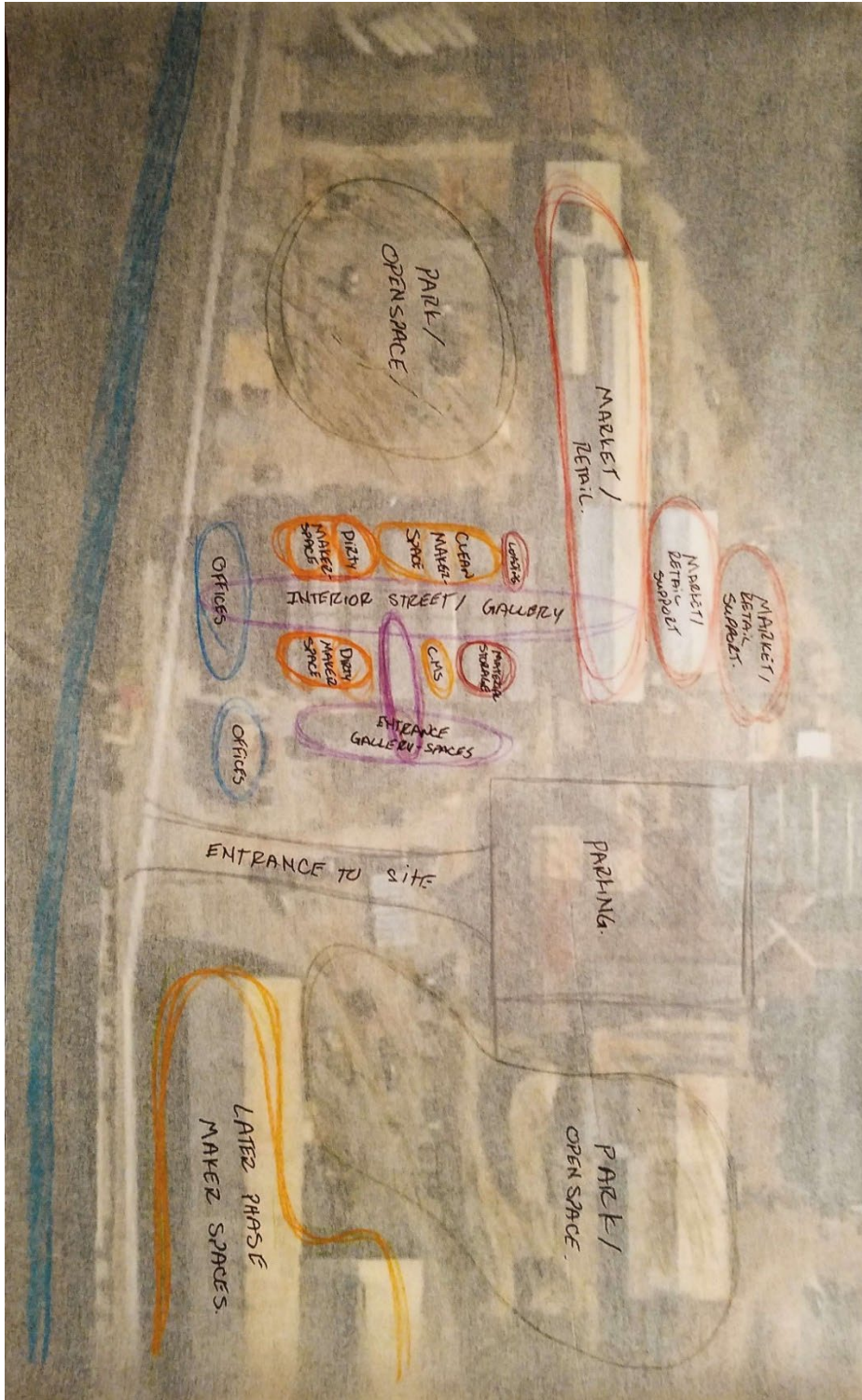


Figure 42 Makerspace Program Solution

(Source: Author)

Makerspace Program Solution

The Blacksmith Shop is utilized as a gallery space and entrance to the Makerspace. Through the East-West axis an interior street connects the Pattern shop offices to the Market/Retail spaces within the Boiler Shop. This space will also perform as an adaptive collaborative space where members can work and converse on project. Additionally, both dirty and clean makerspaces are provided within the 20 feet by 40 feet edge spaces. On the second-floor studio spaces as well as some collaborative office workspaces. (Figure 44)

Conclusion

The Introduction of a Makerspace will provide the site with a business opportunity that can expand across the multiple buildings on site. The nature of makerspaces provides a communal aspect to the site. However, it may not directly connect the existing communities of Johnstown to the site. Fabricating and building products pays respect to the historical “Making” functionality of the building.

A hand-drawn map of Prospect Hill. The Conemaugh River flows from the top left towards the bottom. A New Bridge crosses the river. New Iron Street runs along the riverbank. Various buildings are labeled: Paper Mill, Office Building, Warehouse, Paper, Urban Agriculture, Urban Farm, Urban Commercial/Produce Market, and Urban Green Way. The map is drawn on a piece of paper with a grid pattern.

(Source: Author)

Business Incubator Site Program

This scheme addresses the greenspace within the site as well as Route 56 access and the rerouting of Irons Street the same as the Museum Site Program. (Figure 44) In this scheme the Conemaugh River edge is maintained as it is currently. The removal of Iron Street widens the Johnstown Urban Greenway redesigning it into a space that becomes more parklike rather than the narrow pathway that it is currently.

The Business Incubator as a central catalyst provides utilizes the Blacksmith Shop as a Café or Restaurant for the members of the incubator. Additionally, the Pattern Shop and Rolling Mill Office provide privatized office space that has access to the larger community of the Business Incubator Space (Machine Shop). The Boiler Shop is then transformed into Maker Spaces, this diversifies the site allowing for both types of incubators that can interact with each other. The JWF Buildings are transformed into Urban Agriculture spaces that have a dedicated Farmers Market that is adjacent to the New Iron Street route.

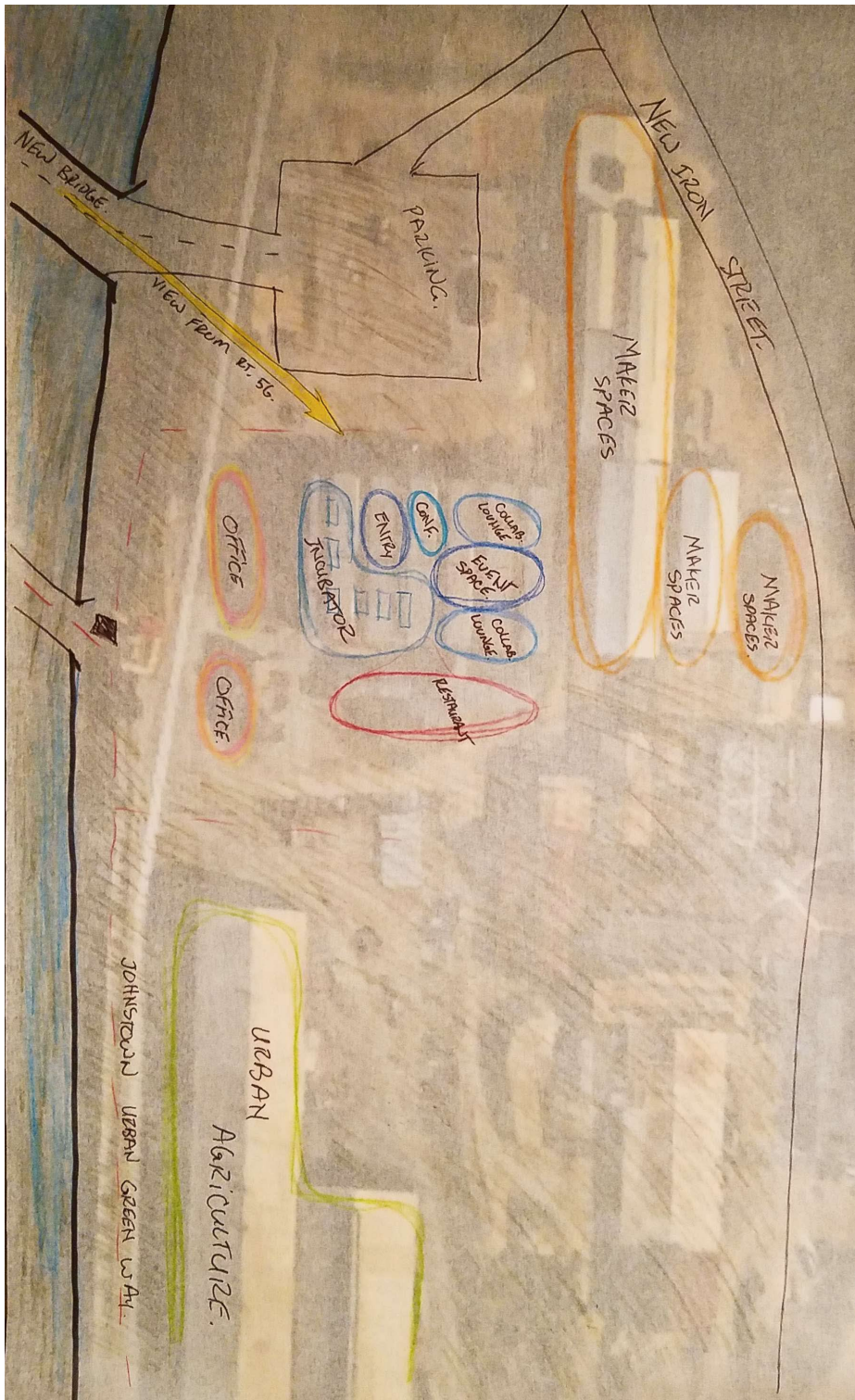


Figure 44 Business Incubator Program Solution

Source: Author

Business Incubator Program Solution

Entering the Business Incubator Space is through a central point on the Northern Façade. (Figure 45) The entry then opens into a collaborative incubator office space. This space is populated with various tables, counters, and collaborative work stations. To the west of the entrance are conference rooms that can be accessed by the members for private meetings. Along the East side of the building is a large even space that is wrapped with two collaborative lounges. The event space is provided for large meetings as well as other collaborative events for a larger number of people. The lounge spaces feature a more relaxed environment and furniture allowing for a laid-back work environment. Additional lounge spaces and some private offices will be located on the second-floor wings.

Conclusion

The Business Incubator program provides a community that will foster startup businesses within Johnstown. This type of space can provide an economic boost to the city, bringing in investors and interests. The program spaces do not by themselves reflect the historical nature of the site. The communal aspect of the programming is like that of the Makerspace, it builds a community within itself yet with the programmatic implementation of urban agriculture, the surrounding communities can be drawn to the site.

Reflection

Each of the schemes provide viable solutions for the site and building programs. However, none of these solutions have completely fulfilled the expectations of the project. Viewing conducting these three schemes has provided valuable insights towards the organization of the site and future programs within the Machine Shop as well as the surrounding buildings and site. When viewing the schemes together all the expectations for this project become fulfilled as well as a potential wholistic design concept. Thus, going forward the project will seek to combine these programmatic solutions meeting the expectations of this thesis. Additionally, it will narrow down the scope to primarily focus on the Machine shop with the expectation that the solutions provide a means in which the adjacent buildings can also be adapted.

Massing and Adaptation Theory

This thesis referenced *Old Buildings New Forms: New Directions in Architectural Transformations* by Francoise Astrog Bollack when implementing and ideating the additions to the existing Machine Shop Structures.⁸³ In this book Bollack proposes that there are five main ways in which adaptations of buildings take form. These categories include insertions, parasites, wraps, juxtapositions, and weave. An insertion takes its form from as an interior mass. This mass is not exposed on the exterior but presents itself within the building. The second category is parasites, these adaptations take place as an add on to the existing building that use existing structure or any other system within the existing building to dictate the addition's form and function. This is followed by the wrap category where the addition takes place on the periphery of the building protecting the existing structure. The fourth category serves as a means of an addition allowing a distinct separation between the existing building and the addition. This can be shown by several means including materiality, color, texture, massing, and often have a clear physical separation. Last is the category of weave, this category focuses on the interplay between existing and new. The seams of between the two are often blurred and are less apparent than the previous categories.⁸⁴

⁸³ Bollack, F. (2013). *Old buildings, new forms*. [New York]: Monacelli Press.

⁸⁴ Bollack, F. (2013). *Old buildings, new forms*. [New York]: Monacelli Press.

Although these categories have distinct characteristics, Bollack suggests that in most cases the adaptation of a building embodies a multitude of these categories.⁸⁵

Adaptive Massing Explorations

Using wrap, juxtaposition, insertion, and parasite as versions, a series of three iterations were provided to support each version. (Figure 46) These twelve iterations resulted in the production of two solutions or schemes. (Figure 47) These solutions contrasted each other in solid versus void form. In the solid form the addition took the shape of the former foundry building with a small connection to the machine shop. This solution provided a means in which to preserve the shape and size of the previous building. On the other hand, the void form wraps the former footprint. This provides a means in which the missing the former foundry building is preserved as a lost entity of the site. This void space would allow for the inclusion of a private courtyard for the building. In addition to its response to the former foundry, the void scheme provided more opportunity for a navigational system not only applied to the building but also for the site. With these advantages the void form was chosen as the massing solution for the addition of the building.

Expanding the Massing Form

The initial void scheme provided the opportunity for connection as well as the ability to expand the form along the connection axis (chapter 9). To provide a marker for the

⁸⁵ Bollack, F. (2013). *Old buildings, new forms*. [New York]: Monacelli Press.

building, an additional mass was introduced to the north of the Pattern Shop. This marker responds to both the Pattern Shop and the Rolling Mill Office by maintaining the approximate 60-foot depth of both buildings. This also provides a means of repetition A-B-A repetition with both the Rolling Mill Office and the new massing maintaining the same width and height in elevation. To contextually juxtapose the adjacent buildings, the new massing takes the shape of a cylinder. (Figure 48) This shape is derived from water storage tanks that are commonly found on steel mill sites. Additionally, a pair of these water tanks can be seen at the river's edge beside the first JWF building providing an additional contextual reference for this shape.

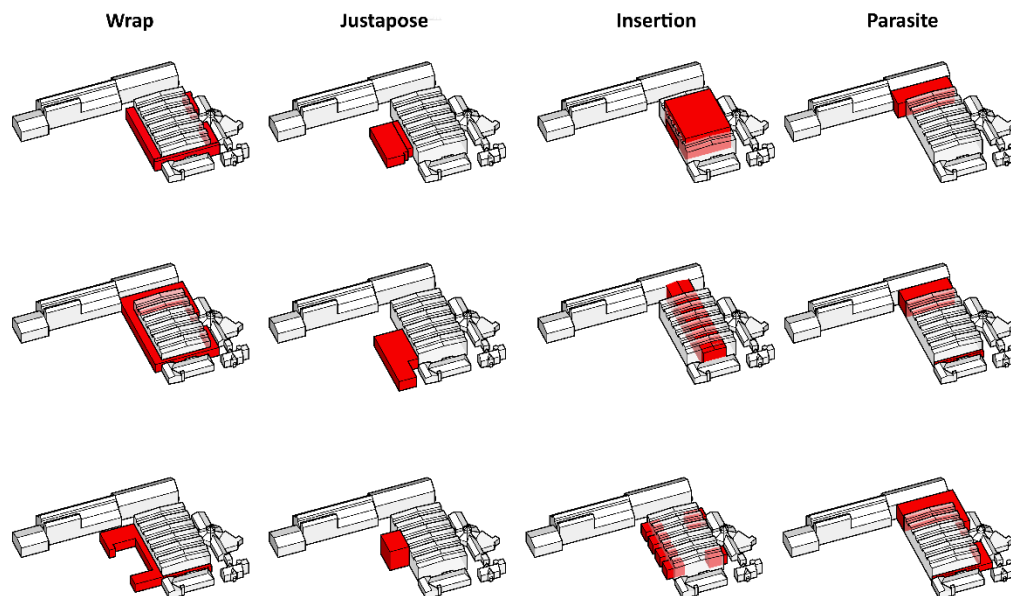
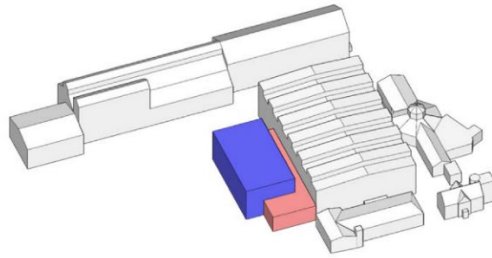


Figure 45 Series of Expansions

Source: Author

Solid



Void

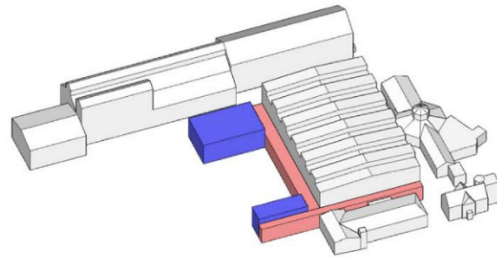


Figure 46 Schemes: Solid & Void

Source: Author

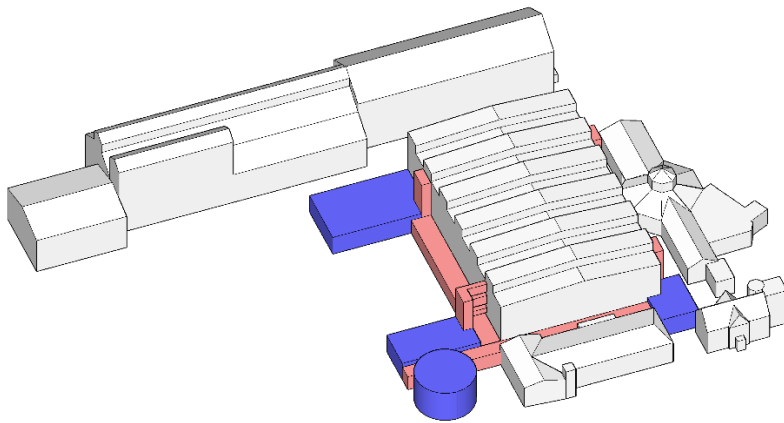


Figure 47 Final Massing Scheme

Source: Author

Chapter 8: Site Design Solutions

The Four Objectives

When addressing the Lower Cambria site, four main solutions erupted. These four solutions include Constructing a Connection, Forging Site Navigation, Resurfacing Lost Relics, and Breathing New Life Into the Landscape. The combination of these objectives provides addresses access issues, activity issues, and provides a system of navigation throughout the site.

Constructing a Connection

The first objective is achieved through the construction of a new bridge. This bridge connects to route 56, that serves as an arterial route into Johnstown. (Figure 49) In addition to the bridge, the existing Iron Street is relocated to the east side of the site at the base of prospect hill. The relocation removes the street from the river's edge broadening the existing Urban Greenway. Iron Street is then provided with the opportunity to expand allowing for larger and heavier traffic that was previously restricted due to its proximity to the Conemaugh river as well as the constricting height requirements of the rail viaduct underpass to the south.

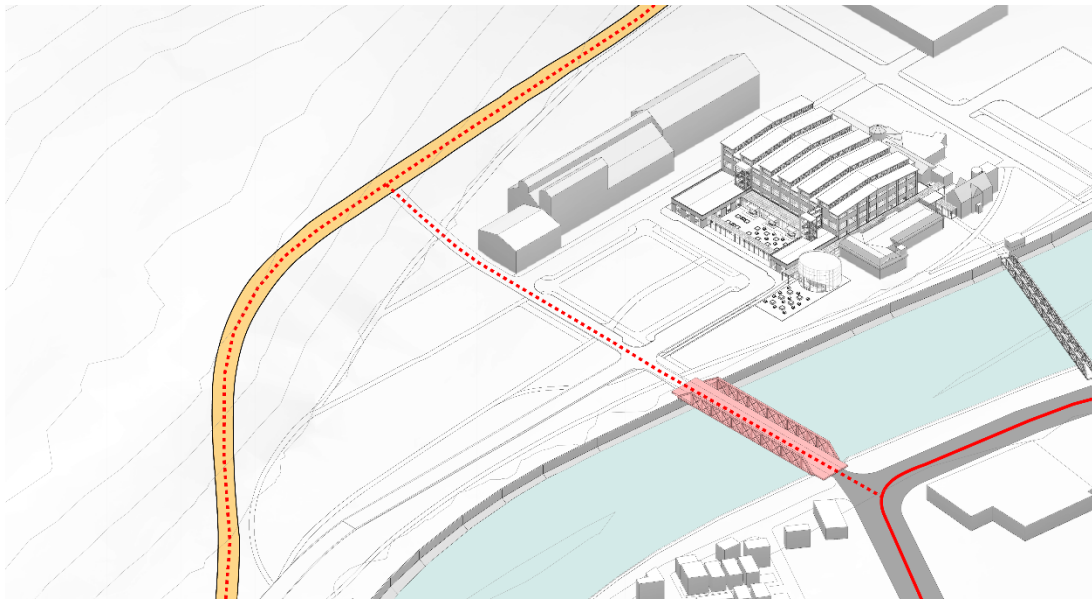


Figure 48 Constructing Connections

Source: Author

Forging Site Navigation

The second objective builds off of the first. As the first objective provides a main means of access to the site, the second, Forging Site Navigation, provides a means of vehicular connectivity throughout the site. (Figure 50) Prior to this street network, the site was not provided with any organizational system for vehicular traffic. This implementation gives the site a navigational structure that connects the buildings as well as a north to south connection.

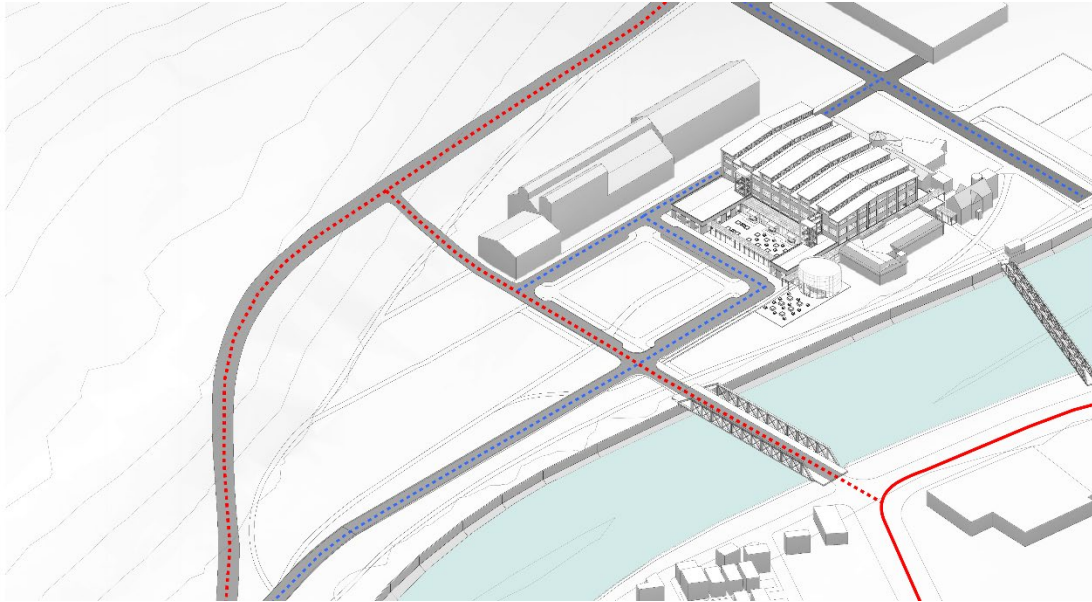


Figure 49 Forging Site Navigation

Source: Author

Resurfacing Lost Relics

The Resurfacing of Lost Relics is the third objective. This aims to bring back and respect aspects of the site that have historical significance. This objective is achieved by resurfacing the rail navigation (Figure 11) as pedestrian pathways as well as planter beds. (Figure 51) Aesthetically the pathways will be fit with brickwork that represents the parallel rail lines that would lead between buildings as well as into the buildings. This series of pathways provides a means of pedestrian access throughout the site that allows the user to recognize and reflect upon the historical navigational systems.

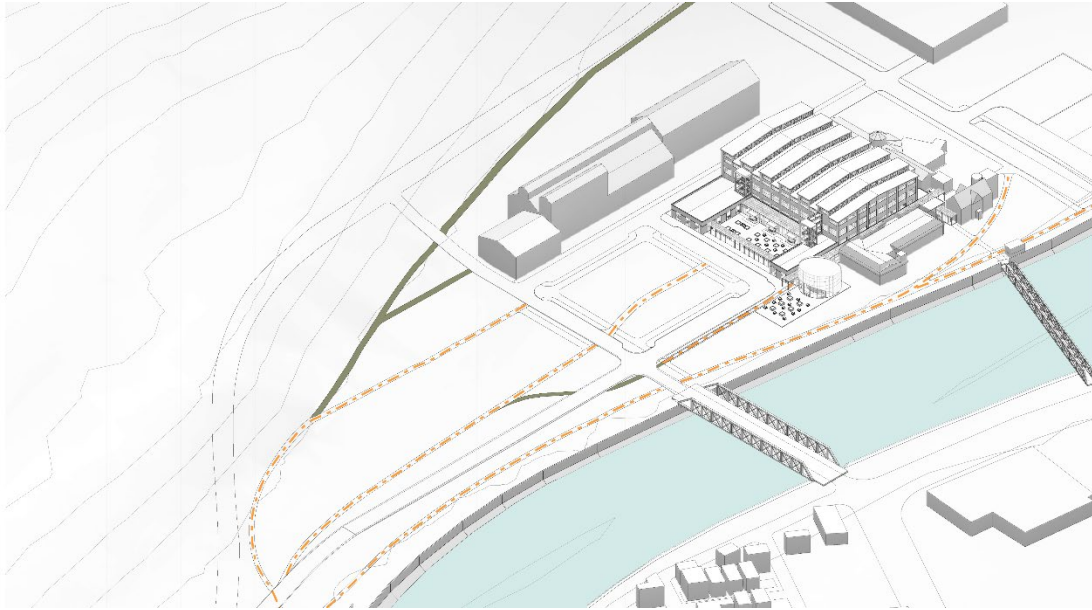


Figure 50 Resurfacing Lost Relics

Source: Author

Breathing New Life Into the Landscape

The pathway system provides a means of pedestrian access throughout the site, connecting the two main greenspaces on the site. This leads us to the last of the objectives: Breathing New Life Into the Landscape. Two main greenspace areas are provided on the site. The first greenspace at the center of the site just north of the Machine shop addition, is constructed with a grove of oak trees that cover the pervious pavement. Using pervious pavers for this location allows for a flexibility of programs within that location. The tall tree coverage allows for a shaded area as well as enough head height to serve as overflow parking for events that take place within the machine shop. In addition, this greenspace can serve as an area to hold farmers markets or similar outdoor events. (Figure 52) North of the Farmers' Market area, grass, shrubs, and trees are planted to provide a Sculpture Garden area that can house

projects and sculptures that are constructed as a part of the machine shop program.

These spaces give the site a broader range of programming that can be used by several different users bringing activity to the site that was previously lifeless.

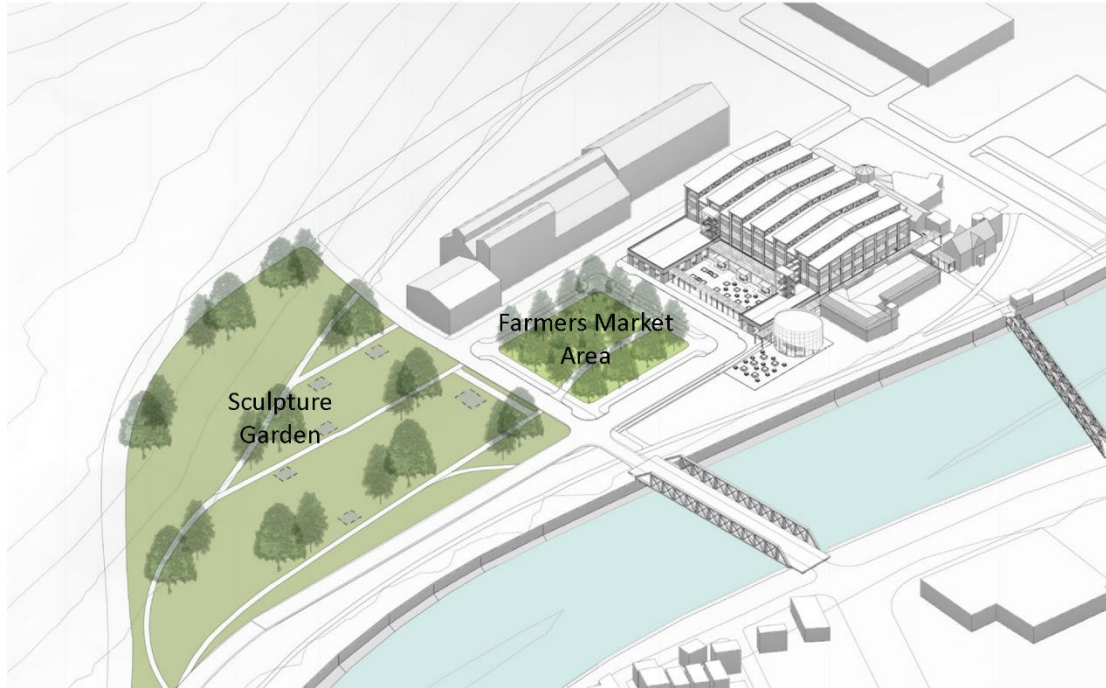


Figure 51 Breathing New Life Into the Landscape

Source: Author

The combination of these four objectives revitalizes the site by providing several necessary elements that result in the activation of the site. As a result, the site becomes accessible, navigable both by pedestrian and vehicularly. Lastly the site is transformed from a barren landscape to one that provides lush greenery with pathways and greenery that serve as a remembrance of its former occupation.

(Figure 53)



Figure 52 Aerial View of Lower Cambria Site Solution

Source: Author

Chapter 9 Building Design Solutions

Program

There are three main constituents that contribute to the programming of the site.

(Figure 54) The first begins with an educational facility. Several secondary education programs are located within the vicinity of Johnstown. The primary expectation is that the University of Pittsburgh at Johnstown would be the primary education system. This expectation is derived from the number of engineering programs that are offered. The second constituent would be the Johnstown Redevelopment Authority (JRA) discussed in chapter 5. The JRA would serve as the managing entity that would market the building spaces to start-up companies seeking a variety of required office spaces. The last constituent would be a large corporate entity seeking a research and design facility. In this scenario the Johnstown Welding and Fabrication company on site provides a viable investing party due to their proximity on site.

With this established, these constituents are provided with shared work spaces, flexible office spaces, instructional spaces, and finally makerspace areas such as workshops and open work areas. In addition to the main programmatic spaces several additional support programs were included.

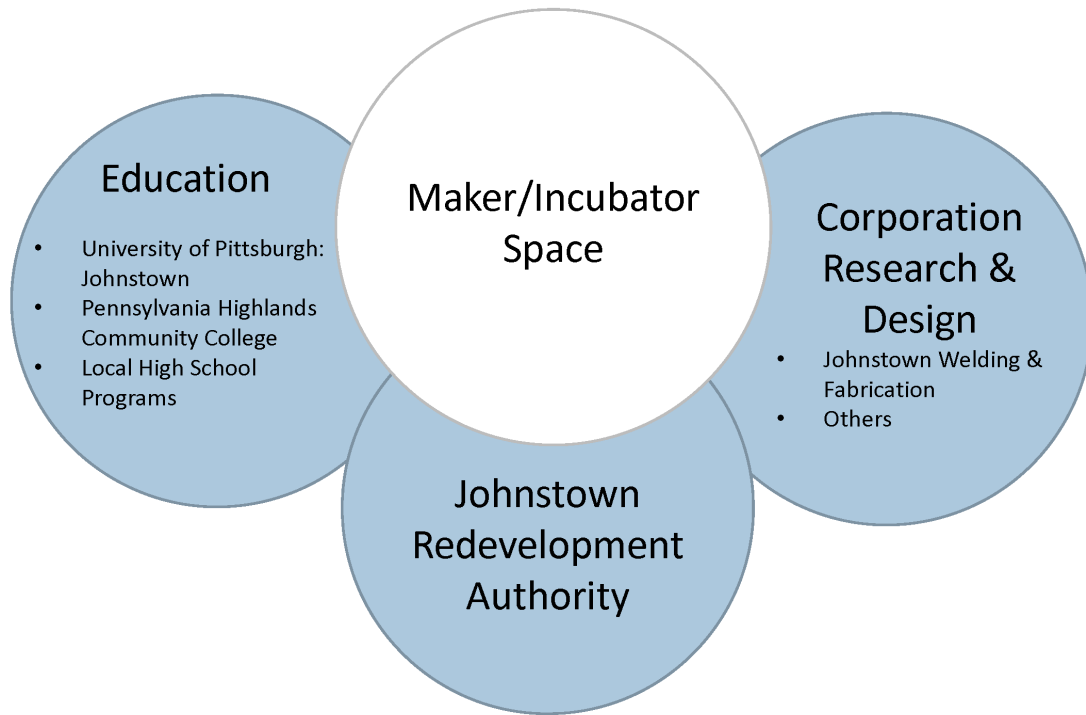


Figure 53 Program Constituent Diagram

Source: Author

Users

There are many types of users that would occupy this program. However, there are four targeted user groups for the building. The first user group is the corporate employee whom will occupy the building for the longest amount of time within the space. These users require an office space as well as workshop for design and research. Additionally, they may require large assembly programming to facilitate display events that they wish to host. The second user group of the facility is the business startup developers and employees. The developers require a flexibility in

office spaces that provides them a means to expand and contract their business.

Students and instructors make up the third user group that are directed towards the educational portion of the programming. These individuals require instructional spaces as well as spaces that promote collective work. The educational program is provided with the ability to study and develop projects that can be constructed within the machine shop facilities. In addition to the instructional spaces students and instructors will require access to workshops and spaces to assemble projects as well as the spaces that promote ideation. The last targeted user group is the visitor.

Visitors are provided with two primary spaces. The first of these spaces is a gallery space that depicts the historical value of the site. The second space provided for visitors is a large assembly space. This will serve as the main intent for the visitor as the events inside the assembly space are the primary attraction for visitors.

Building Objectives

Like the site objectives, the building objectives were narrowed down to four main themes. These themes include Constructing Connectivity, Molding a Maker/Thinker Community, Implementing New Enclosure, and Contrasting New and Old. These objectives provide a means to adapt the existing building and organize the programmatic requirements of the users.

Constructing Connectivity

Acting as a transitional zone, the machine shop connects the northern greenspace to the southern industrial site. To create a connection from north to south a spine was

generated that serves as the arterial circulation for the building as well as providing opportunities for connection to the adjacent buildings. (Figure 55 & 56) On the north periphery of the machine shop, an additional axis runs east to west connecting the main entry on the west to the shared work space on the west and the interior open work space within the building. Along this corridor, are a series of conference rooms that extend into the court. These conference rooms serve as scheduled spaces for developers to utilize for meetings.

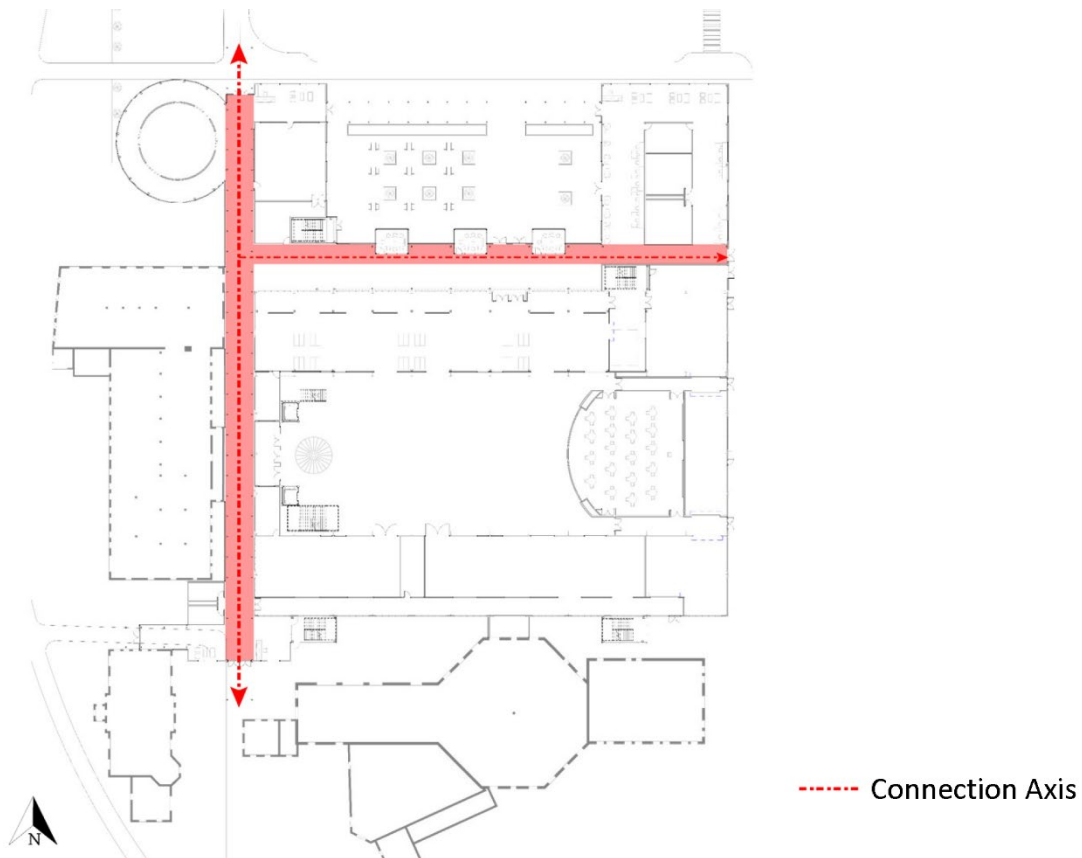


Figure 54 Axis Connections

Source: Author

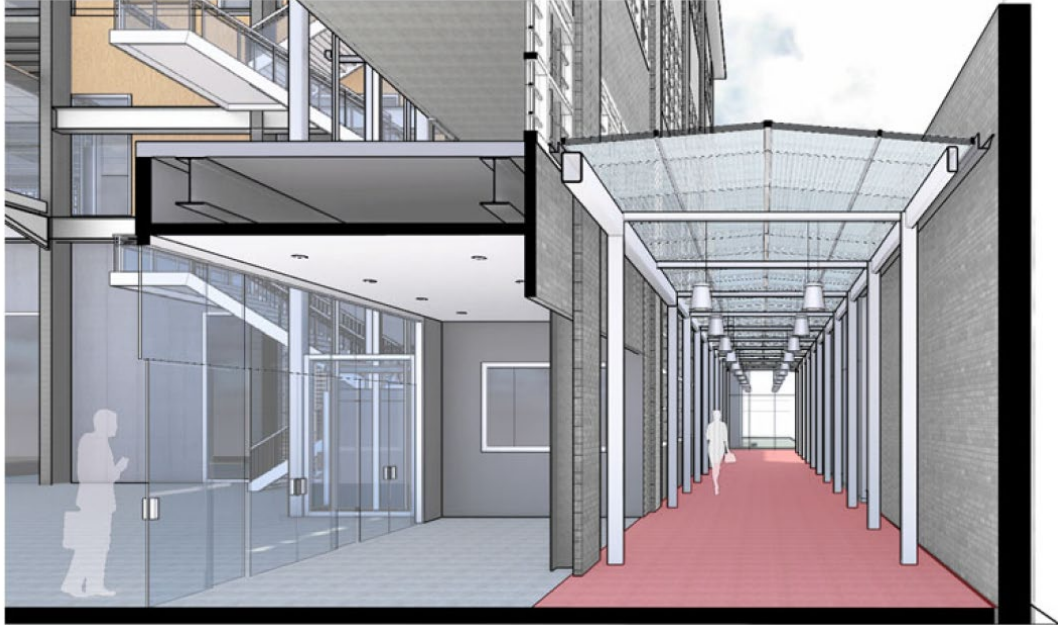


Figure 55 Axis Section Perspective Heading South

Source: Author

Molding a Maker/Thinker Community

The number of required spaces combined with the supplemental spaces aim to promote a maker/thinker community. This is primarily achieved through the organization of the spaces within the existing building in addition to the new addition.

Ground Floor

Creating the connection axis generates the primary and secondary entrance to the space. The primary entrance is at the north end of the axis with the southern end serving as the secondary entrance that would be used by corporate employees. (Figure 57) Entering from the north, the user is greeted immediately by the Iron Gallery

(Figure 58) that provides a look into the operations of the site and building throughout its history.

On the west side of the addition across the Foundry Court, is the shared work space that provides small start up companies with desks and lounge spaces to work at. In order to use these spaces, the start up companies pay a minimal fee that provides them access to these spaces in addition to the rest of the spaces that are on the ground floor. These spaces include the Steel Hall (Figure 59) that serves as a space for conventions and as a breakout space for large projects being constructed. In the periphery of the Steel hall are three main makerspaces. Two workshops are provided, one for steel fabrication and one for wood fabrication. Two additional spaces at the west end of the existing building are also provided for 3D printing spaces. One of these spaces is directly connected to the woodshop; the other is located in the north wing of the existing building. Additionally in the north side wing of the existing building, is the open work space. This space is provided with a number of mobile workbenches as well as a storage area at the east end. Within this space users are able to assemble projects, ideate using the eraserboard walls, and find commonalities between the usertypes by collaborating on projects.

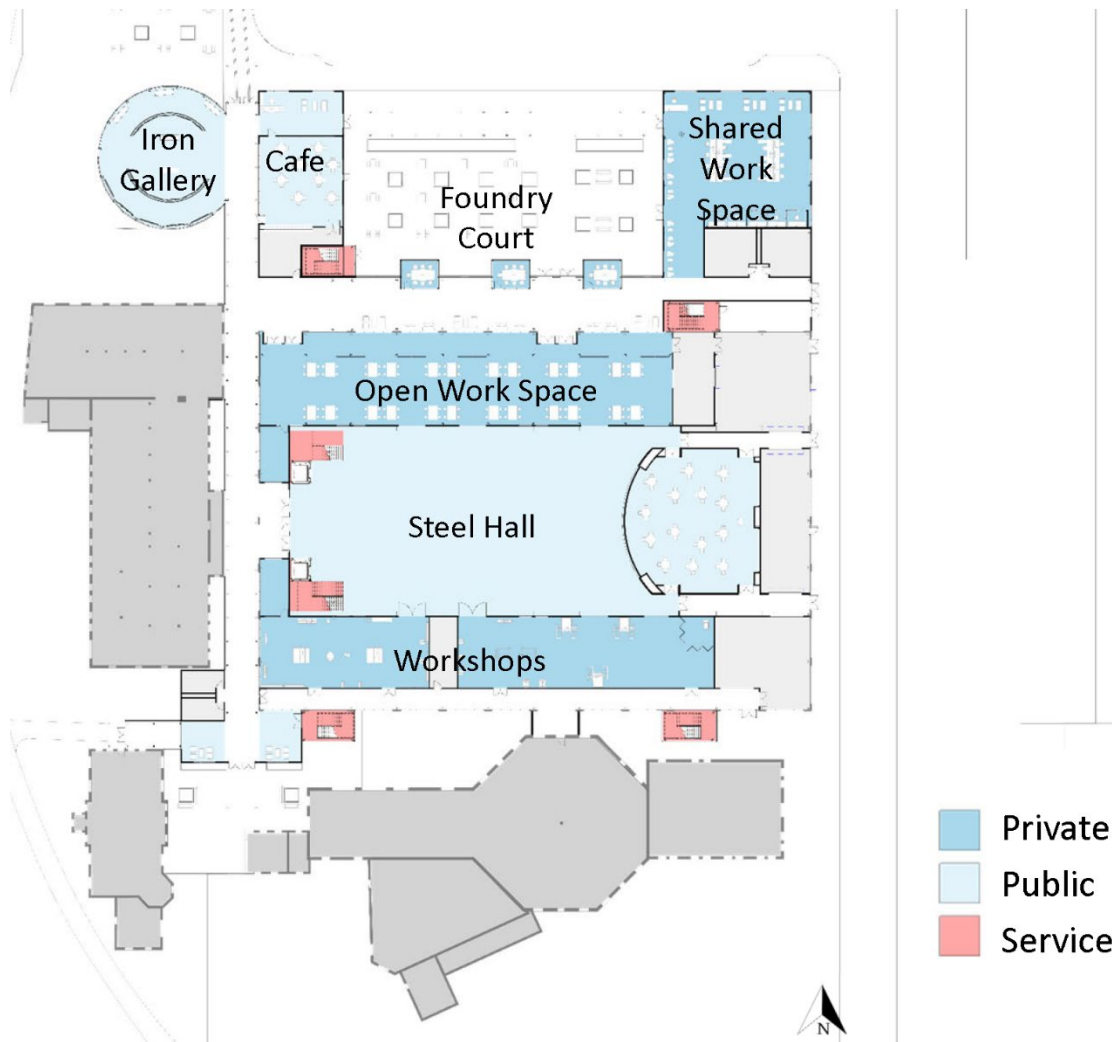


Figure 56 Ground Floor Plan

Source: Author



Figure 57 Iron Gallery

Source: Author



Figure 58 Steel Hall

Source: Author

Educational Floor

To provide instructional spaces a new floor is added on the north wing of the existing building. This floor is constructed at 12'-0" from the existing ground floor. (Figure 60)

To provide a connection between the instructional spaces and the open workshops below, an alternating high bay and low bay system is established. The location of the instructional space serves as the low bay area for the open workspace below. Thus, between each of these instructional spaces a high bay is provided with a catwalk serving as circulation to the spaces. From this catwalk, the user can see into the instructional space as well as down into the open work space. This enables the user to create a connection between the physical project and the theoretical. (Figure 61)

Second/Third Floor

The second and third floors are primarily programmed for office use. (Figure 62)

These offices offer a flexibility in size so that businesses can easily expand and contract their office footprint as needed. The details for construction of these floors will be discussed further in the following section Implementing New Enclosure.

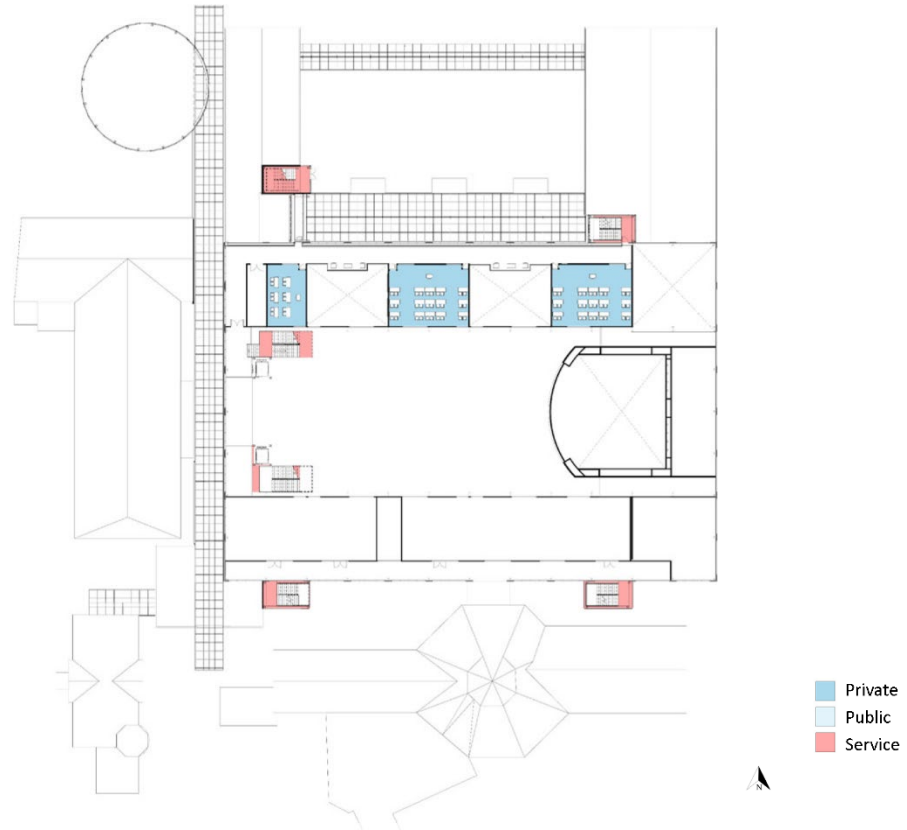


Figure 59 Educational Floor

Source: Author



Figure 60 Educational Catwalk

Source: Author

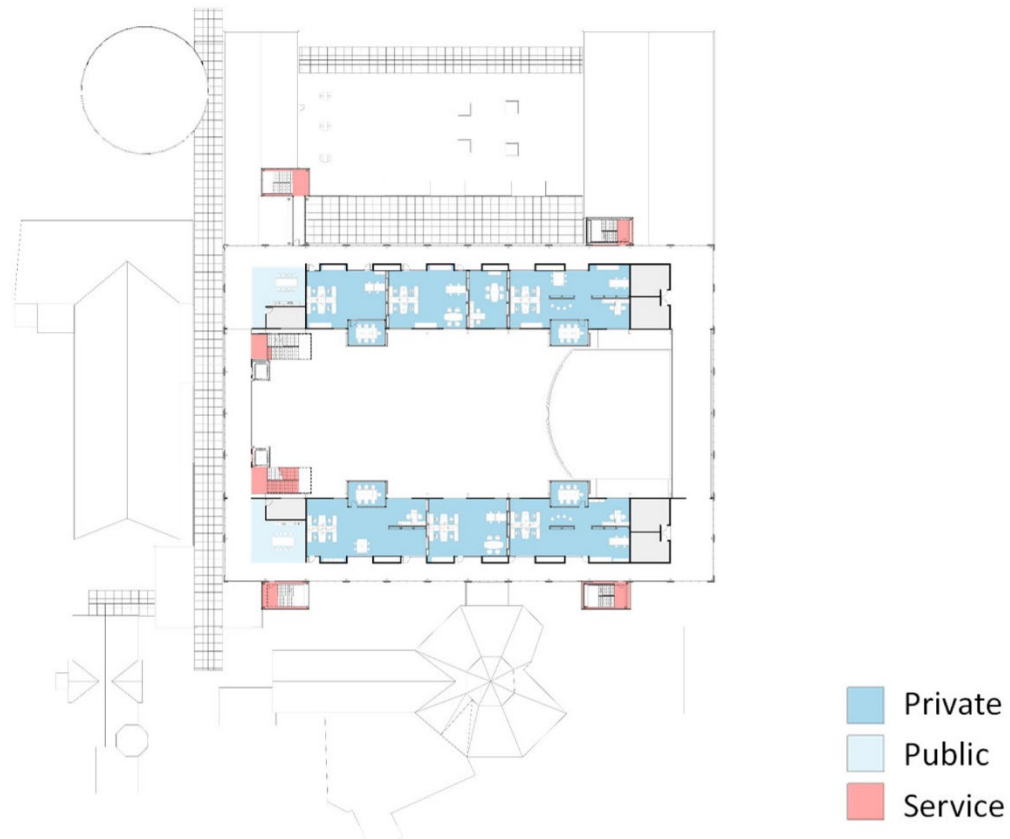


Figure 61 Second and Third Floor Plans

Source: Author

Implementing New Enclosure

As was mentioned in chapter 4, the construction of the machine shop is of steel riveted structure with a brick façade, concrete roofs, and a concrete floor. Although there is some insulation value in each material, these materials do not provide enough insulation for today's standard of conditioning. To address this issue, a modular

system is developed for each floor other than the ground floor. (Figure 63) The first step in constructing this new envelope is to install six-inch structural insulated panels (SIPS) for walls. Installed within the SIP panel system are several glazed panels that provide natural light into the offices from the existing exterior windows. Second a ceiling is hung from the existing structure with 4 inches of insulation. To achieve the aesthetic of a floating plane for the ceiling, clerestory windows are installed where the ceiling and walls meet. This also provides another opportunity to gain natural light into the office spaces from the exterior windows. The final step to completing the envelope is the installation of a raised access floor. This type of flooring system provides flexibility for services to be run underneath the floor. Additionally, a layer of insulation is installed to complete the envelope.

Previously mentioned before, these modules provide the flexibility of the occupant to expand and contract their office spaces. This is promoted with the inclusion of mobile divider walls. The divider walls are constructed with a steel structure and acoustical insulation. On one side, shelves are installed on the opposite side of the walls a marker board serves as the wall finish. This provides each office with some storage as well as a usable wall surface. To provide some rigidity for the placement of these walls, a C channel is placed at the top of these walls with a screw system that rises and lowers the channel. Embedded into the ceiling at regular intervals, are additional C channels that serve as receivers to the wall C channels. This system gives rigidity to the placement of the divider walls.

Through these two systems, a space is provided that provides flexibility in addition to a space that can be more stringently conditioned.

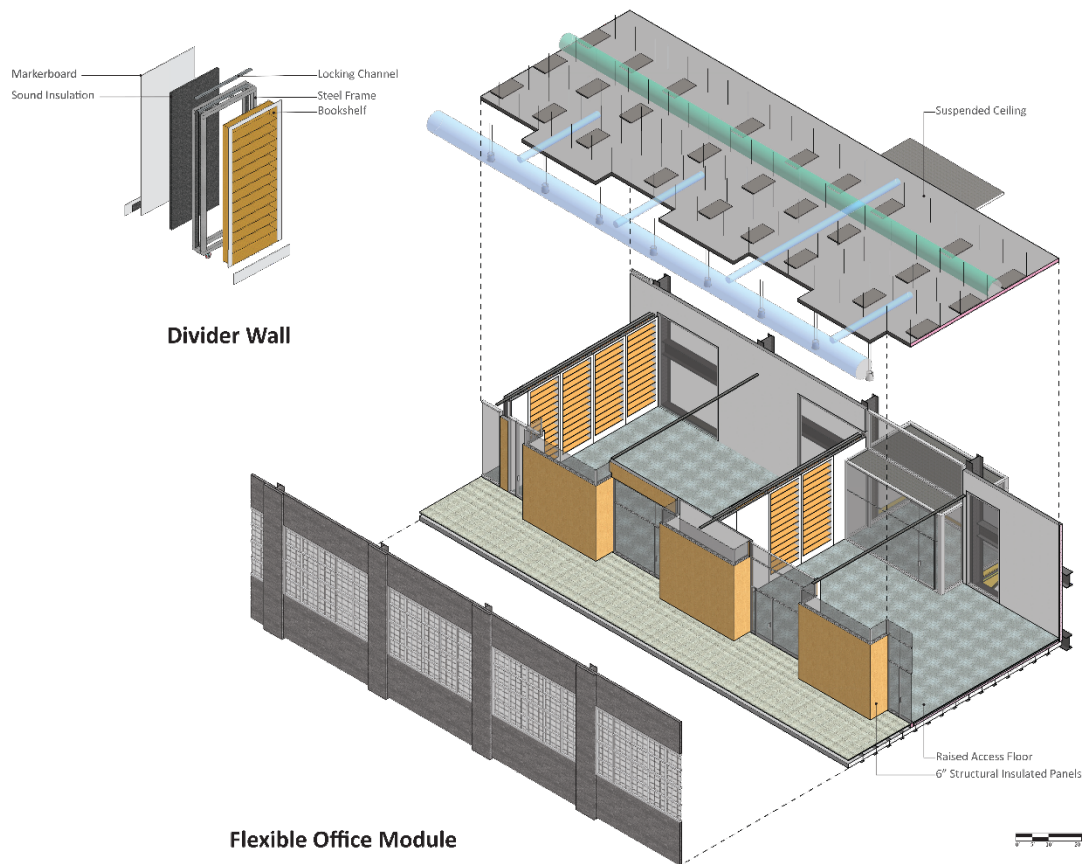


Figure 62 Flexible Office Module

Source: Author

Contrasting the New and Old

These buildings maintain historical and cultural value to the city of Johnstown. To maintain clarity between the existing structure and the new intervention attention is directed to the use of materials within the space. With the existing structure being over 100 years old, the remaining materials possess a cold, weathered, and rough

aesthetic. In juxtaposition to the existing materials, the new material pallet depicts warm and smooth textures. (Figure 64) This pallet includes the use of concrete panels for the base of the building, the exposed plywood from the SIP panels, and the addition of glazing throughout these spaces. In addition to these finishes, the use of hollow steel structure for the intervention juxtaposes the existing riveted W beam and column structure. The overall contrast of new versus old provides an environment that exploits the rich textures of the existing materials while bringing a level of warmth to the building through the use of wood.



Figure 63 Section Perspective Facing East

Source: Author

Chapter 9 Conclusion

Conclusion

The solutions provided for this postindustrial remnant building are by no means exhaustive. However, this thesis presents a means in which these types of buildings can be revitalized through the implementation of new program and the adaptation of the current envelope system.

The development of the modular envelope provides a system that can be adapted for buildings with similar construction typologies. In this case the solutions derived from this thesis serve as an applicable means to the adjacent building on the Lower Cambria Site in addition to the large number of buildings that have been left throughout the rustbelt cities.

With further investigations, there are several solutions that could be explored. Such solutions include exploiting the existing design for passive daylighting and the use of sustainable heating systems such as geothermal heat in addition to any number of other sustainable strategies. These investigations would provide another layer of development for these projects. The next suggestion for further investigation is derived from the commentary during the thesis defense. This investigation would dive into drivers for the activation of the Steel Hall.

This thesis has investigated the adaptation of postindustrial remnant buildings through the implementation of educational, business incubator, and makerspace program. This has resulted in a solution that can be applied to numerous buildings within the city of Johnstown, Pennsylvania as well as the large number of rustbelt cities throughout the United States.

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